Hewlett-Packard Pocket Calculator Buyer's Guide

HEWLETT **hp** PACKARD

FALL 1975

Hewlett-Packard pocket calculators —for people who need *more* than the ordinary

Most people like yourself, who use a pocket calculator for business or professional purposes, need something *more* than one that just adds, subtracts, multiplies and divides—and perhaps calculates square roots and percentages.

You need a pocket calculator that not only handles your simple problems quickly and easily, but has the reserve power to solve even the lengthy, complex or repetitive problems with just a few keystrokes.

And this is where Hewlett-Packard pocket calculators surpass all others.

HP pocket calculators are designed and built for *you*—the business or professional person—who needs a calculator rugged enough for day-in, day-out use and accurate enough to risk a reputation on . . . and as up-to-date as tomorrow.

HP pocket calculators meet these requirements—and *more*—because they're the most advanced pocket calculators in the world, with:

- Advanced capabilities—built-in functions and memory power—so you can solve *more* types of problems faster and easier, with greater accuracy.

- The RPN logic system with an automatic four-memory stack—the most sensible, most versatile, most efficient logic system for solving complex problems.

- Uncompromising quality—innovative design, high quality components and precision assembly combine to produce calculators that are second to none and superior to most.

Therefore, before you select *any* calculator, take a few minutes to explore, within the pages of this catalog, these three reasons why Hewlett-Packard pocket calculators are the most advanced in the world. Prove to yourself—as more than a million others already have—that if you work with numbers, it *makes sense* to buy the best— a Hewlett-Packard pocket calculator.

The Hewlett-Packard Warranty

Each Hewlett-Packard pocket calculator is warranted against defects in materials and workmanship for one (1) year from the date of delivery. During the warranty period, Hewlett-Packard will repair or, at its option, replace at no charge components that prove to be defective provided the calculator is returned, shipping prepaid, to Hewlett-Packard's Customer Service facility.

This warranty does not apply if the calculator has been damaged by accident or misuse, or as a result of service or modification by other than an authorized Hewlett-Packard Customer Service facility.

No other express warranty is given by Hewlett-Packard. HEWLETT-PACKARD SHALL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES.

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Cover Illustration: The Hewlett-Packard HP-65 fully programmable pocket calculator was used to back up on-board computers and to calculate two critical mid-course correction maneuvers just prior to the linkup of the U.S. Apollo and the Russian Soyuz spacecraft. For a full description of the HP-65 computer-calculator, see page 13.

Illustration courtesy of National Aeronautics and Space Administration.

Uncompromising quality is the standard at Hewlett-Packard.

And here are 12 examples to back up that statement...

1. Every key is double injection molded. The symbol on the face of the key goes through the entire key, so it won't wear off —no matter how often the key is pressed.

2. Every key has a positive click action, so you know for sure that the function has registered.

3. Every key is tested twice. A quality control inspector presses the keys to make sure they *feel* right, then a specially-designed machine *exercises* them to make sure they *function* right.

4. The numbers in the light-emitting diode (LED) display are bright red, so you can read them clearly and without distortion.

5. The OFF/ON switch is lubricated with silicone, so that it slides smoothly. And it slides in a horizontal, rather than a vertical, plane to prevent it from moving accidentally when you put the calculator in its carrying case or in your shirt pocket.

6. Under the keyboard is a moisture-proof polyethylene barrier to help protect the inside of the calculator from coffee spills and similar hazards.

7. The heavy gauge plastic case is contour-designed to fit the hand comfortably, and rugged enough to withstand a tumble to a hard floor. (One HP pocket calculator even withstood an accidental journey through a snow blower.)

8. The top case or keyboard assembly is welded, so it won't come apart accidentally and to keep dust and moisture from entering.

9. The battery compartment door opens easily (but not accidentally), without using a coin or key, so you don't have to worry about nicks or, worse, damage that could prevent the door from being opened or closed.

10. The specially-engineered rechargeable battery pack—included with each HP pocket calculator—is a single unit, so you can replace it quickly and easily.

11. The socket for the adapter/recharger plug is recessed to ensure a positive connection, so it won't accidentally become loose in the middle of a calculation. And it's designed so there's no way to connect the wrong plug by mistake.

12. Every single HP calculator must meet stringent quality control standards, or it's rejected. Only in this way can Hewlett-Packard produce pocket calculators that provide better performance . . . and lasting value.
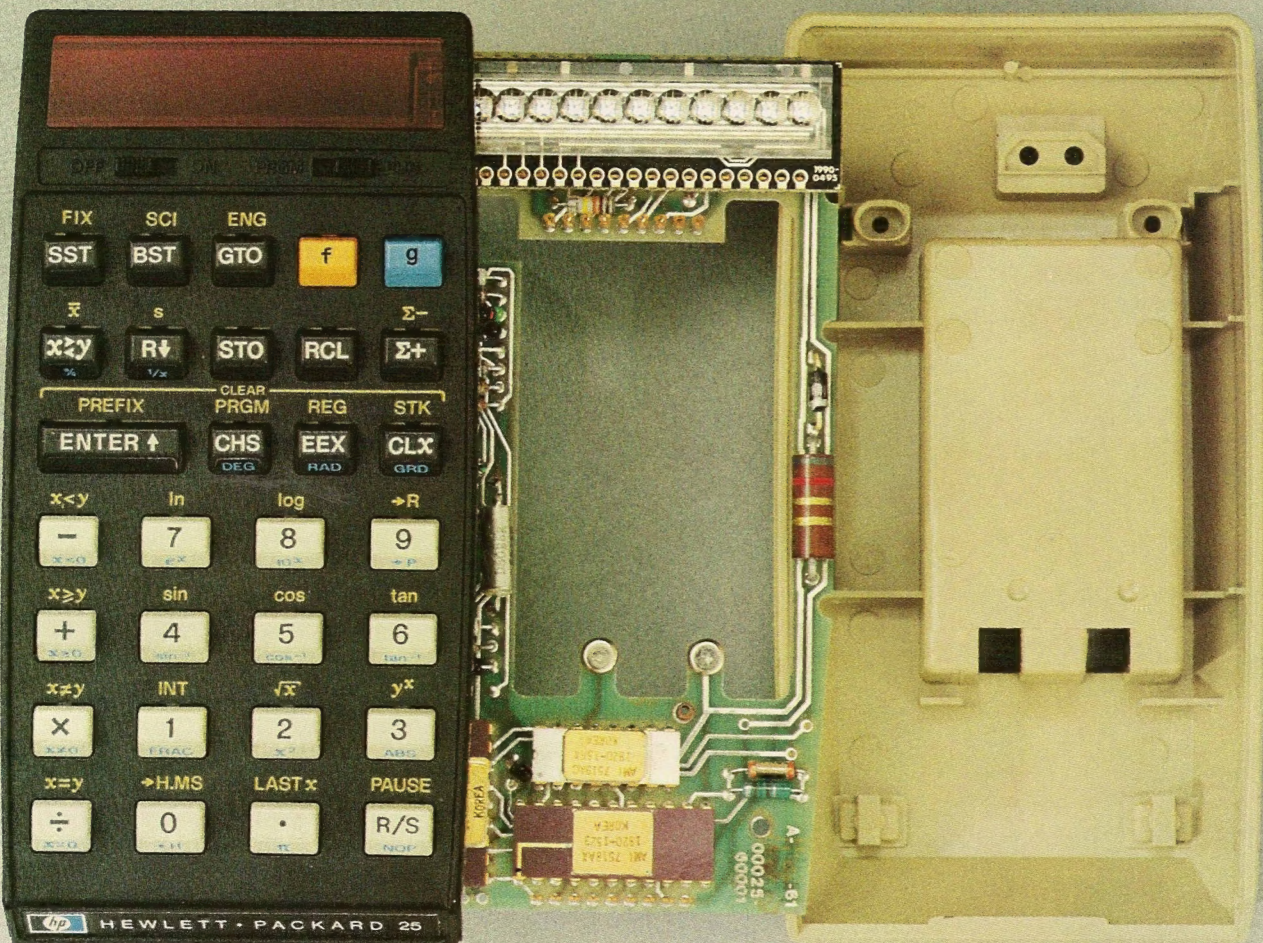
> **"The success and prosperity of our company will be assured only if we offer our customers superior products that fill real needs and provide lasting value, and are supported by a wide variety of useful services—both before and after the sale."**
>
> —Statement of Corporate Objectives
> Hewlett-Packard

When William R. Hewlett and David Packard founded Hewlett-Packard in 1939, they offered only one product—an audio oscillator. But it was superior to all others available at the time. And their policy—of introducing only products that fill a need and provide lasting value—has continued for 36 years.

Today, Hewlett-Packard offers more than 3,000 different products, ranging from microscopic components to complete computer systems. The company is one of the world's leading designers and manufacturers of electronic, medical, analytical and computing instruments and systems.

The product line includes the atomic clocks used by most observatories in the world as a primary time standard; patient monitoring equipment and diagnostic instruments for the medical field; communications equipment; electronic surveying instruments, and analytical products such as gas chromatographs, spectrometers and instruments for precisely measuring pressure and temperature.

Calculators are a major line

In the data processing field, Hewlett-Packard offers the most extensive line of computing alternatives for science and engineering. Beginning with mini-computers for science and engineering, HP went on to design and manufacture electronic, programmable desktop calculators; computer systems for business, industry and education; the first small-scale computer system with multi-programming and multi-lingual capabilities, and an extensive selection of peripherals (disc memories, plotters, etc.) and software.

Then HP utilized this knowledge and experience to introduce the first pocket-sized scientific calculator—the HP-35, which set the standard for all other brands and models. As you will see in this catalog, Hewlett-Packard now offers a complete line of scientific, engineering, business and multi-purpose pocket calculators designed for professional use. Their owners include Nobel laureates, astronauts, business people, doctors, scientists and engineers in every field, educators and students.

R&D is extremely important

In order to carry out the company's program of providing innovative products, an unusually high percentage (approximately 7%) of annual sales revenue is invested into research and development. In 1974 alone this amounted to over $70 million.

More than 1,500 engineers and scientists work full time in R&D, developing original concepts and designing new and more advanced products. As a result of their efforts, fully one-half of HP's current business is represented by products that didn't exist a few years ago, including all the pocket calculators in this catalog.

To manufacture, market and service Hewlett-Packard products, the company has grown into a multinational corporation with over 28,000 employees. HP has manufacturing facilities in the United States, Germany, Scotland, France, Japan, Malaysia and Singapore and 172 sales and service offices in 65 countries throughout the world.

Hewlett-Packard is also . . .

Electronic instruments and systems for medicine.

Automated systems for testing and analyzing.
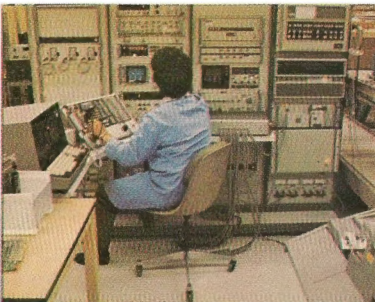
Programmable desktop systems for science, engineering, business.

Mini-computer systems for industry, and business.

Hewlett-Packard Scientific Pocket Calculators...

Select the one calculator that best fits your needs today...and tomorrow

Are you considering the purchase of your first scientific pocket calculator....or are you planning to move up to a more advanced model?

Either way, it's important that you select a calculator that not only can solve the problems you're facing today, but also can solve the problems you're likely to face tomorrow....in the days, months and years ahead.

As you read about the five scientific pocket calculators (and the scientific desktop calculator) offered by Hewlett-Packard, compare the built-in functions, the memory power and the other features each model provides. Whichever HP scientific calculator you select, you can be assured that it's the *finest* in its class . . . because HP's standards of quality permit nothing less.

The HP-21 and HP-45 scientific pocket calculators, and the HP-46 scientific desktop calculator, offer a wide range of functions, memory, and features to help you with routine calculations in mathematics and statistics. These calculators most likely can handle the problems you face today quickly and easily.

However, for tomorrow's needs you may well want to investigate a programmable calculator. Programming is simply the ability of a calculator to learn, remember, and execute automatically a series of steps necessary to solve a particular problem. But with HP's programmable calculators you don't have to master a special "computer" language...all you do is enter the same keystrokes you would use to solve your problem manually. From then on the calculator can solve that problem for you, faster and without keystroke error.

The HP-25 scientific programmable pocket calculator offers full editing, to help you add or change steps quickly and easily, direct branching, for problems requiring iterative routines, and conditional testing, so that the calculator can make decisions for you based on the data.

If you need even more, take a look at the HP-55 advanced scientific programmable pocket calculator. This versatile calculator also has full editing, direct branching, and conditional testing to help you with programming. But the HP-55 also provides advanced statistical capability, extra memory power, and even a 100-hour digital timer.

For the ultimate in problem-solving power—in any field— Hewlett-Packard offers you the famous "pocket computer"—the HP-65 fully programmable pocket calculator. It makes problem solving almost automatic, because you can program it yourself (and save your programs on magnetic cards) or you can use it with pre-recorded program cards available in a wide range of disciplines—including engineering, finance, mathematics, medicine, statistics, and navigation.

Since you're investing in a calculator that fits your needs today—and tomorrow—read the descriptions of each HP scientific calculator carefully. To help you with your decision, we've prepared a comparison chart at the back of this catalog. One of these calculators is right for you.

HP-25
Scientific Programmable

Hewlett-Packard's newest and lowest-priced programmable pocket calculator.

Keystroke programming with the most-used advanced scientific, engineering and mathematical functions.

The HP-25 is the lowest-priced Hewlett-Packard programmable pocket calculator. The HP-25 can retain and repeat a program up to 49 steps in length. So you don't have to press the same keys again and again when the same problem is worked with different data.
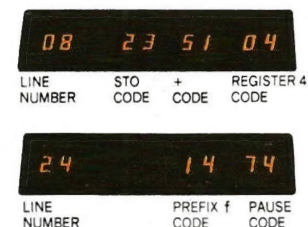
PRGM ▥▥▥▥▥▥▥ RUN

To write a program, simply set the HP-25 to PROGRAM mode. Then press the keys you'd normally press to solve the problem. Your program is retained in the HP-25's program memory.

[R/S] To solve the problem, switch to RUN mode and enter the data. Then press the "Run/Stop" key. Your answer appears on the HP-25 display. To solve other problems using the same program, just enter the new data and press the "Run/Stop" key again.

Because your program does the calculation automatically there's less chance for error than if you had to repeat the keystroke sequence yourself step by step. Also, it takes but a fraction of the time.

Program memory.

The HP-25's program memory consists of 49 steps, numbered 01 through 49. Your program remains stored for as long as you leave the HP-25 turned on, or until you erase or change your program.

08		23	51		04
LINE NUMBER		STO CODE	+ CODE		REGISTER 4 CODE

24			14	74
LINE NUMBER			PREFIX f CODE	PAUSE CODE

The program memory uses a simple numeric code, based on the position of each key on the keyboard. For example, "31" means "3 rows down, 1st key"—the "ENTER" key. To conserve steps, each prefixed function (e.g., "f" "x̄") takes only one program memory step.

[BST] [SST]

The "Back STep" and "Single STep" keys let you review the entire memory one step at a time, in either direction.

If you want to change your program, simply stop it at the appropriate step and key in a new entry, which will overwrite the previous one. To test your program a step at a time, switch to RUN and press "SST" repeatedly. You will see the numeric code when you press the key and the intermediate solution when you release the key.

Decision branching.

Like a computer, the HP-25 can be programmed to make decisions, because it can do conditional branching. You can program it to test the rela-

tionship between two values, by means of these tests:

$x < y$	$x \geqslant y$	$x \neq y$	$x = y$
$x < 0$	$x \geqslant 0$	$x \neq 0$	$x = 0$
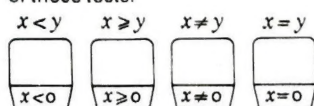
Depending on the outcome of the tests, the HP-25 will *automatically* skip a step of the program... or it will continue through the program in sequence.

Or, by means of the "GoTO" key, you can program the HP-25 to branch directly to a specified step, and then continue executing the program.

Pause feature.

PAUSE Another new feature on the HP-25 is the "PAUSE" key. You can use it to momentarily interrupt (about one second per Pause command) the program execution and display the contents of the X register. This gives you the opportunity to review or write down intermediate results.

## Absolute and Truncation functions.

[ABS] The ABSolute value function allows you to take the absolute value of a number within a programmed calculation.

[INT/FRAC] The INTeger/FRACtion truncation function allows you to keep only the integer or fractional portion of a number. This is especially useful in base conversion, random number generation, or for storing two numbers in one memory.

Advanced capabilities.

Most keys now perform three commands. Some commands are labeled in gold above a key, or labeled in blue on the underside of a key, and activated by first pressing the appropriate gold or blue prefix key(s).

Extra trigonometric capability.

[→R/→P] *Rectangular/polar coordinate conversions:* You can convert rectangular coordinates to polar coordinates or vice versa, enabling you to do vector arithmetic quickly, easily and accurately.

[→HMS/→H] *Angle (time) conversions:* You can convert angles (times) in decimal degrees (hours) to angles (times) in degrees (hours)/minutes/seconds ...or vice versa.

Of course the HP-25 also provides the six basic trig functions—sin x, arc sin x, cos x, arc cos x, tan x, arc tan x.

Logarithmic functions:

[ln/e^x] [log/10^x]
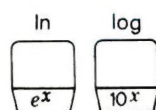
The HP-25 computes both natural and common logarithms as well as their inverse functions (antilogarithms).

Extra statistical capability:

[Σ−] [Σ+] *Summations:* The "Σ +" key automatically calculates n, Σ x, Σ x², Σ y, Σ xy for statistical and vector calculations. Data may be deleted via the "Σ −" key.

[x̄] [s]

Mean and standard deviations: The HP-25 also calculates the mean and standard deviation of a group of data.

Your choice of display formats:

[FIX] [SCI] [ENG]

When you first turn on the HP-25, the display is rounded to two decimal places. By pressing "f" "FIX" and a number key (0 to 9), you can specify the number of decimal places. Or you can select scientific notation, by pressing "f" "SCI" and a number key to specify the number of decimal places (up to seven digits after the decimal point).

$$-14.641278 - 12$$

New to HP pocket calculators is engineering notation, which allows all numbers to be shown in a modified scientific notation with exponents of 10 that are multiples of three (e.g., 10^3, 10^5, 10^{12}).

Whichever notation is selected, the HP-25 always maintains the complete 10-digit number internally. Also, the HP-25 switches the display automatically from fixed point notation to full scientific notation whenever a number is too large or too small to be seen in fixed point notation.

Superior HP memory power.

Instead of writing down and re-entering numbers manually, you can simply store them in any or all of the eight addressable memories, and recall them when needed. The memories may also be used for register arithmetic.

Plus other quality HP features.

In addition to the 8 addressable memories, the HP-25 has a four-memory stack—which makes possible the famous RPN logic system—and a "Last X" memory.

And a free applications book.

The HP-25 Applications Programs Book contains 54 programs drawn from the varied areas of number theory, trigonometry and analytical geometry, statistics, finance, surveying, and navigation. Thus, whether your interest lies in solving a particular problem, or in learning more about the programming power of your calculator, this free book will help you get the most from your HP-25.

Functions and features:
Programming:
Program writing capability • Single step execution or inspection of a pro-

gram • Pause (to display intermediate result) • Program editing capability • 8 relational tests: $x < y$, $x \geqslant y$, $x \neq y$, $x = y$, $x < 0$, $x \geqslant 0$, $x \neq 0$, $x = 0$ • Conditional branching • Direct branching

Keyboard commands:
Trigonometric functions: 3 angular modes (degrees, radians, grads) • Sin x • Arc sin x • Cos x • Arc cos x • Tan x • Arc tan x • Rectangular coordinates ↔ Polar coordinates • Decimal angle (time) ↔ Angle in degrees (hours)/minutes/seconds
Logarithmic functions: Log x • Ln x • e^x • 10^x
Statistical functions: Mean and standard deviation • Positive and negative summation giving n, Σx, Σx², Σy, Σxy
Other functions: Integer (gives only integer portion of number) • Fraction (gives only fractional portion of number) • Absolute (gives absolute value of x) • y^x • $\sqrt{x}$ • $1/x$ • π • x^2 • % • Register arithmetic in all 8 addressable memories • Addition, subtraction, multiplication or division in serial, mixed serial, chain or mixed chain calculations
Data storage and positioning operations: Data entry • Stack roll down • x,y interchange • Data storage • Data recall • Change sign • Enter exponent
Warning indicators: "Error" appearing in display indicates improper operation. All decimal points lighted indicates low battery.

Memory:
4-memory stack • "Last X" memory • 8 addressable memories • Program memory for storage of up to 49 steps

Specifications:

AC: 115 or 230 V, ± 10%, 50 to 60 Hz, 5 watts.
Battery: 2.5 Vdc nickel-cadmium rechargeable battery pack.
Weight: HP-25: 170 g (6 ounces) with battery pack • Recharger: 142 g (5 oz.) • Shipping wt.: Approx .7 kg (1.5 lb).
Dimensions: Length: 13.0 cm (5.1 inches) • Width: 6.8 cm (2.7 inches) • Height: 3.0 cm (1.2 inches).
Operating temperature range: Operating 0°C to 45°C (32°F to 113°F).

The HP-25 outfit includes:

HP-25 Programmable Scientific Pocket Calculator • Rechargeable battery pack • Recharger/ ac adaptor • Soft carrying case • Illustrated Owners Handbook • HP-25 Applications Programs • HP-25 Quick Reference Guide.
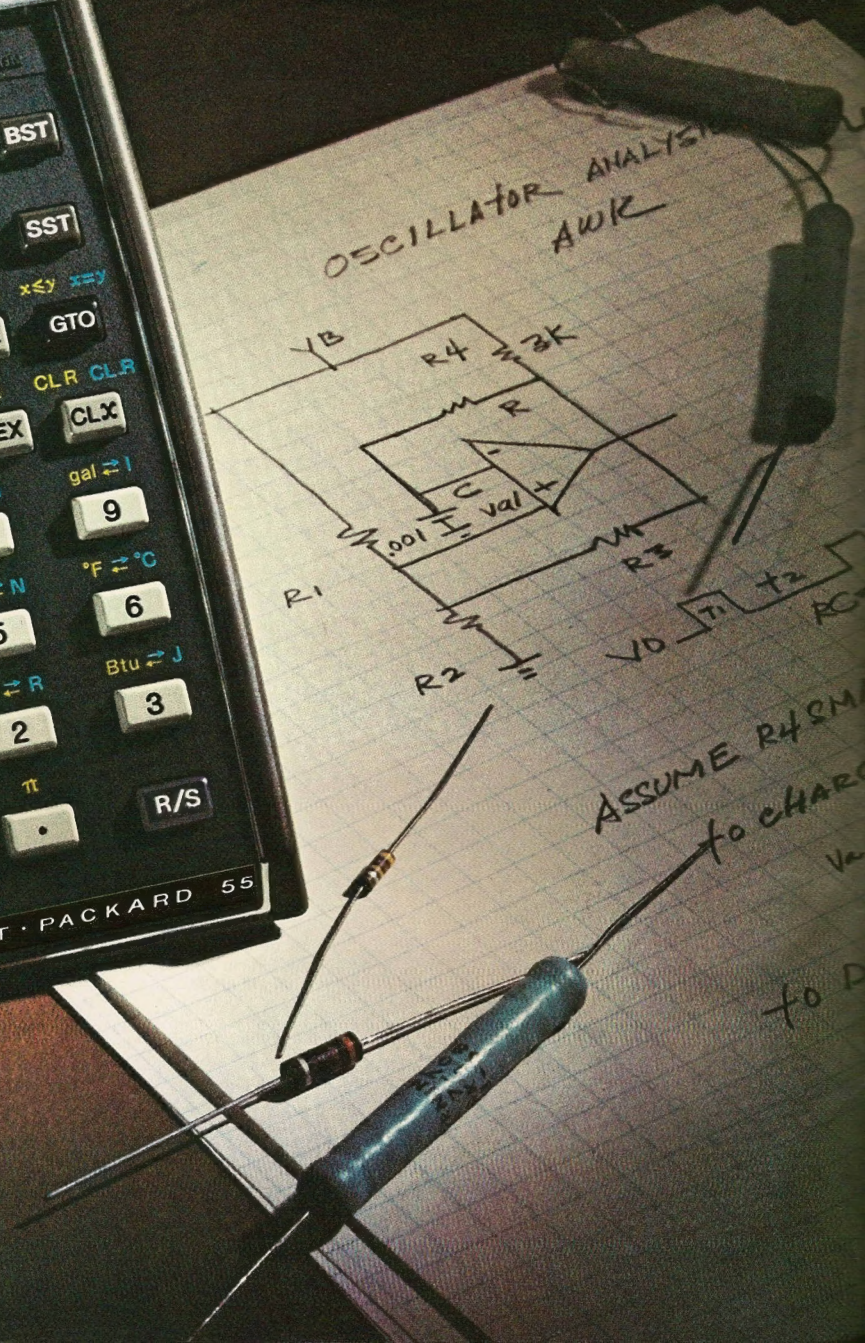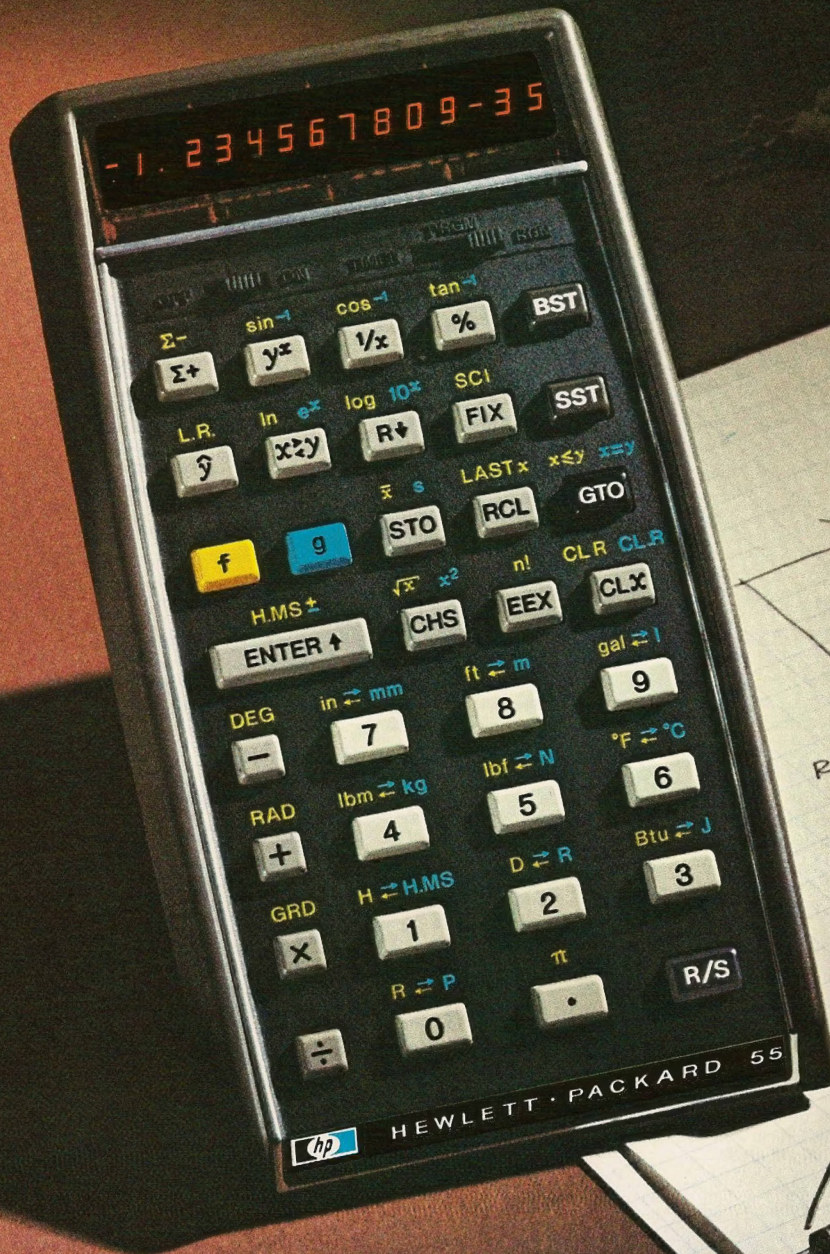
HP-25 Outfit $195.00

HP-55 Advanced Scientific Programmable

Designed with the power to solve complex, repetitive or iterative problems

Featuring keystroke programming... 86 keyboard commands...20 addressable memories...*and* a built-in timer

Here is a scientific pocket calculator with the keyboard power to solve *all* types of problems faster, easier and more accurately.

And because it's programmable—capable of retaining and repeating keystroke routines—the HP-55 solves repetitive or iterative problems in far less time than conventional calculators.

Unconventional, too, is the inclusion of a digital timer—to time lab experiments or other procedures with split-second accuracy.

86 keyboard commands

The HP-55 offers 86 keyboard functions and operations—and all but a few may be incorporated into your programs.

Extra statistical capability

$\boxed{\Sigma -}$
$\boxed{\Sigma +}$

Summations: Useful when working with vectors as well as statistics, this key automatically calculates and stores for recall or further use: Σn, Σx, Σx^2, Σy, Σy^2 and Σxy. Data may be deleted via the "$\Sigma -$" key.

$\overline{x} \quad s$
$\boxed{\overline{x}}$

Mean and standard deviation: The HP-55 simultaneously calculates the means and standard deviations of both the x and y values.

L.R.
$\boxed{\hat{y}}$

Linear regression: After two or more data points are accumulated with the "$\Sigma +$" key, you can quickly calculate linear regression with the "L.R." key (via the least squares method). Then, using the "$\hat{y}$" key, you can calculate other data points on the curve.

100-hour digital timer

The HP-55's digital timer—unique in an advanced scientific pocket calculator—measures time in hours, minutes, seconds, and hundredths. Intermediate time measurements—"splits"—may be stored in any of the HP-55's first 10 addressable memories, so you can easily time up to 10 events in the same experiment simultaneously. And the 100-hour digital timer is accurate to ±.01%.

Extra metric conversion capability

$in \rightleftarrows mm$ $ft \rightleftarrows m$ $gal \rightleftarrows l$

$lbm \rightleftarrows kg$ $lbf \rightleftarrows N$ $°F \rightleftarrows °C$

$Btu \rightleftarrows J$

Not just constants, but true direct two-way conversions between U.S. and metric units are fast and easy—and exceedingly accurate.

Extra trigonometric capability

$R \rightleftarrows P$

Coordinate conversions: Convert polar coordinates to rectangular coordinates, or vice versa. This lets you do vector arithmetic quickly and accurately.

$D \rightleftarrows R$

Angle conversions: You can convert directly from degrees to radians, or from radians to degrees.

$H \rightleftarrows H.MS$

Angle (time) conversion: In any of three angular modes, you can convert decimal angles (hours) into angles (times) in degrees (hours)/minutes/seconds... or vice versa.

$H.MS\pm$

Angle (time) arithmetic: You can add or subtract angles (times) in degrees (hours)/minutes/seconds.

20 addressable memory registers!

The more memories a calculator has, the less writing down and re-entering of numbers *you* have to do... and the less chance for error.

That's why the HP-55 has more memories than *any* other pocket calculator—20!

They're all fully addressable, too. This means you can store and retrieve data (e.g., a constant or intermediate solution) pushbutton fast from the keyboard or automatically in your program. And, with 10 of the memories you can do register arithmetic (i.e., directly add to, subtract from, divide into, or multiply the contents of a memory).

Data manipulation is extremely easy when working the most complex mathematical problems.

Keystroke programming ... so you can create the exact programs you need—on the spot

To solve a problem with an ordinary calculator, a certain sequence of keystrokes is required—and all the keys must be pressed again every time the problem is worked with different data. Not so with the HP-55.

Simply set the HP-55 to PROGRAM and enter the keystrokes needed to solve the problem. (But don't enter the data.) Your program—up to 49 keystrokes in sequence—is retained in the HP-55's program memory.

$\boxed{R/S}$ To solve the problem, switch to RUN and enter the data. Then press the "Run/Stop" key to run your program. In seconds, the HP-55 gives you your answer. To solve other problems using the same program, just enter new data and press the "Run/Stop" key again.

Because your program does your calculation automatically, there's far less chance for error than if you had to do it manually. And it takes but a fraction of the time.

It's also easy to review, edit or test your program ...

$\boxed{BST}$ $\boxed{SST}$ $\boxed{GTO}$

The program memory consists of 49 steps, numbered 01 through 49. To review the entire memory—one step at a time—press the "Back STep" or "Single STep" key. Or press the "Go TO" key plus the number of the step you want. To test your program, a step at a time, switch to RUN and press "SST" repeatedly.

Want to change your program... or part of it? Switch to PROGRAM and enter a new sequence of keystrokes to overwrite the previous program or any section of it. Your program remains stored for as long as you leave the HP-55 turned on.

You can even program the HP-55 to do computer-like branching

Like a computer, the HP-55 can actually be programmed to make decisions... because it can do conditional branching.

You can program it to test the relationship between two values, via these tests:

$x \le y \quad x = y$

Depending on the outcome of the tests, the HP-55 will *automatically* branch to the specified step of the program... or continue through the program in sequence.

Or, using the "Go TO" key, you can program the HP-55 to branch directly to a specified step, and then continue executing the program.

Both conditional and direct branching are useful in solving iterative problems.

Plus other quality HP features ...

In addition to the 20 addressable memories, the HP-55 has a four-memory stack—which makes possible the famous RPN logic system—and a "Last X" memory.

Light-emitting diode display: Displays up to 10 significant digits, plus two-digit exponent and appropriate signs. Two selectable display modes: fixed point, with automatic overflow and underflow into scientific, and scientific with dynamic range of 10^{99} to 10^{-99}. Automatic decimal point positioning. Selective round-off; range: 0-9 decimal places. Flashing display indicates improper operation; flashing decimal points indicate low battery.

And two optional handbooks

The *HP-55 Math Pac* and the *HP-55 Stat Pac* document the most efficient routines for solving hundreds of common but complicated math and stat problems. You completely eliminate the time and energy you'd otherwise spend creating programs to solve these problems. $10.00 each.

Functions and features

Programming:
Program writing capability • Single step execution or inspection of a program • Program editing capability • $x \le y$, $x = y$ conditional branching • Direct branching

Keyboard commands:
Trigonometric functions: 3 angular modes • Sin x • Arc sin x • Cos x • Arc cos x • Tan x • Arc tan x • Rectangular coordinates ↔ Polar coordinates • Decimal angle ↔ Angle in degrees/minutes/seconds • Decimal time ↔ Time in hours/minutes/seconds • Angle in degrees ↔ Angle in radians • Angle arithmetic
Logarithmic functions: Log x • Ln x • e^x • 10^x
Statistical functions: Mean and standard deviation (one or two variable) • Linear regression (two variable) • Linear estimate • Factorial • Positive and negative summation giving Σn, Σx, Σx^2, Σy, Σy^2, Σxy
Metric conversion functions: Btu ↔ J • lbm ↔ kg • lbf ↔ N • in ↔ mm • ft ↔ m • gal ↔ l • °F ↔ °C
Other functions: y^x • $\sqrt{x}$ • $1/x$ • π • x^2 • % • Register arithmetic in 10 addressable memories • Addition, subtraction, multiplication or division in serial, mixed serial, chain or mixed chain calculations
Data storage and positioning operations: Data entry • Stack roll down • x, y interchange • Data storage • Data recall • Change sign • Exponent entry

Memory:
Four memory stack • "Last X" memory • Nine addressable memories • Program memory for storage of up to 49 keystrokes.

Timing:
Digital timer • 0-100 hour range • ±.01% accuracy • Displays hours/minutes/seconds/hundredths • Times for up to 10 events may be stored in addressable memories

Specifications
Power: AC: 115 or 230 V ± 10%, 50-60 Hz. Battery: 3.75 Vdc, nickel-cadmium rechargeable battery pack. *Weight:* HP-55: 255 g (9 oz) with battery pack • Recharger: 142 g (5 oz.) • Shipping weight: approx. 2 kg (4.5 lb). *Dimensions:* Length: 14.7 cm (5.8 in) • Width: 8.1 cm (3.2 in) • Height: 1.8 to 3.3 cm (0.7 to 1.3 in). *Operating temperature range:* 0° C to 50° C (32° F to 122° F).

The HP-55 outfit includes:
HP-55 Programmable Scientific Pocket Calculator • Rechargeable battery pack • Recharger / ac adapter • Soft carrying case • Illustrated Owner's Handbook • Quick Reference Guide • Pad of programming worksheets

HP-55 Outfit $335.00

HP-21 Scientific

A smaller scientific calculator with extraordinary problem solving power.

32 built-in functions ... an addressable memory ... and famous HP quality— all in a unit so small it comfortably fits in a shirt pocket.

The HP-21 is the lowest-priced scientific pocket calculator HP offers, yet it has all the functions and features you'd expect to find in a scientific pocket calculator.

More trigonometric capabilities

→R	→P

Coordinate conversions—Convert polar coordinates to rectangular coordinates, or vice versa. This lets you do vector arithmetic quickly and easily.

DEG ||||||||||||▬▬ RAD

Angular mode selection—Just flip a switch to perform trig operations in either of two angular modes: degrees or radians. You can also convert angles from one mode to the other push-button fast.
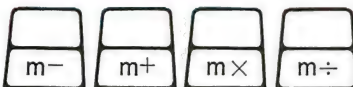
SIN	COS	TAN
SIN⁻¹	COS⁻¹	TAN⁻¹
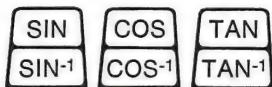
Standard trig functions—The HP-21 gives you all of the standard trig functions: Sin x, Arc sin x, Cos x, Arc cos x, Tan x and Arc tan x.

Logarithmic capabilities

e^x		
LN	LOG	10^x

Standard log functions—The HP-21 also gives you all of the standard log functions: log x, ln x, e^x and 10^x.

Full register arithmetic

m−	m+	m×	m÷

Register arithmetic—The HP-21 has an addressable memory for storing constants or other data, for use later on in a calculation. Any of the four arithmetic operations may be performed directly upon this stored data.

Plus other quality HP features

The HP-21 also includes a four memory stack, which makes possible the famous RPN logic system.

Light-emitting diode display—Recessed for better contrast in harsh lighting. Displays up to 10 significant digits (eight plus two-digit exponent in scientific notation), and appropriate signs. Two selectable display modes: fixed point, with automatic overflow and underflow into scientific, and scientific with a dynamic range of 10^{99} to 10^{-99}. Automatic decimal point positioning. Selective round-off; range: 0-10 (in scientific, 0-8). "ERROR" appearing in display indicates improper operation. Lighted decimal points indicate low battery condition.

Functions and features

Keyboard commands:
Trigonometric functions: 2 angular modes • Sin x • Arc sin x • Cos x • Arc cos x • Tan x • Arc tan x • Rectangular coordinates ↔ Polar coordinates

Logarithmic functions: Log x • Ln x • e^x • 10^x

Other functions: y^x • $\sqrt{x}$ • $1/x$ • π • Register arithmetic • Addition, subtraction, multiplication or division in serial, mixed serial, chain or mixed chain calculations

Data storage and positioning operations: Data entry • Stack roll down • x, y interchange • Data storage • Data recall • Change sign • Exponent entry

Memory:
Four memory stack • Addressable memory

Specifications:
AC: 115 or 230 V ±10%, 50-60 Hz.
Battery: 2.5 Vdc nickel-cadmium rechargeable battery pack.
Weight: HP-21: 170 g (6 oz) with battery pack • Recharger: 142 g (5 oz) • Shipping weight: approx. 680 g (1½ lb)
Dimensions: Length: 13.0 cm (5.1 in) • Width: 6.8 cm (2.7 in) • Height: 3.0 cm (1.2 in)
Operating temperature range: 0° C to 45° C (32° F to 113° F)

The HP-21 outfit includes:
HP-21 Scientific Pocket Calculator • Rechargeable battery pack • Recharger/ac adapter • Soft carrying case • Illustrated Owner's Handbook
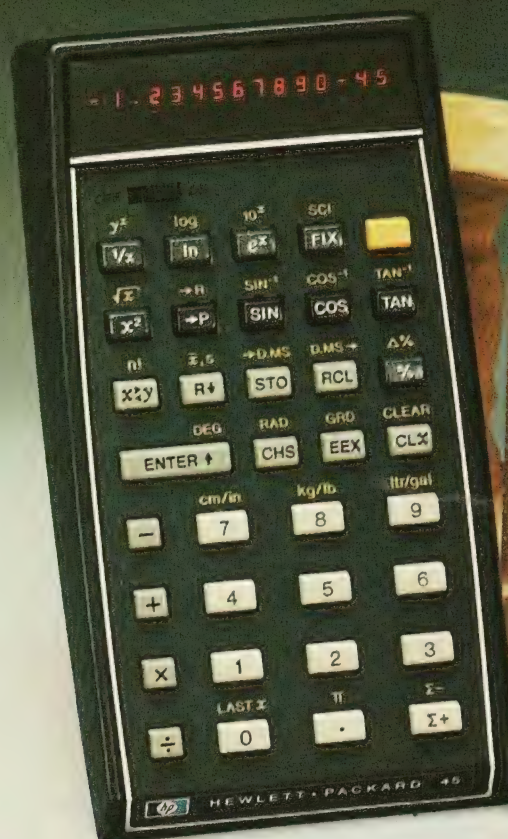
HP-21 Outfit $125⁰⁰

HP-45 Advanced Scientific

Acclaimed by scientists and engineers as the standard of the industry

Known as the scientific pocket calculator against which all others are judged, the HP-45 can quickly and accurately solve just about any type of complex problem you're likely to face. Just press the keys to use the HP-45's general math, trig, log, stat, metric/U.S. unit constants, or rectangular/polar coordinate conversion functions.

Its four dozen built-in functions and data manipulation operations —plus nine addressable memories— give it more power than any other non-programmable scientific pocket calculator.

Advanced trigonometric capabilities

→R
→P

Coordinate conversions—convert polar coordinates to rectangular co-ordinates, or vice versa. This lets you do vector arithmetic quickly and accurately.

DEG   RAD   GRD

Angle mode—You can calculate trig functions in any of three angular modes—degrees, radians or grads. You can also convert from an angle in one mode to an angle in another mode with a few keystrokes.

→D.MS   D.MS→

Angle (time) conversion—In any of three angular modes, you can convert decimal angles (times) into angles (times) in degrees (hours)/minutes/seconds . . . or vice versa.

Advanced statistical capability

Σ−
Σ+

Summations—Useful when working with vectors as well as statistics, this function automatically calculates and stores for recall or further use: Σn, Σx, Σx² and Σy. Data may be deleted via the "Σ−" key.

x̄, s

Mean and standard deviation—The HP-45 simultaneously calculates the mean and standard deviation of a group of data.

n!

Factorial—Press this key to calculate the factorial of positive integers, for rapid calculations of combinations and permutations.

Advanced conversion capability

cm/in   kg/lb   ltr/gal

Metric/U.S. unit conversion constants—Just press these keys for constants to convert U.S. units to metric units, or vice versa. Ten-digit accuracy.

Advanced memory power

Nine addressable memories mean that you have far less writing down and re-entering to do, and far less chance for error. Data manipulation in and out of memories is fast and easy, and you can even do register arithmetic.

Plus other quality HP features . . .

The HP-45 also includes a four-memory stack—which makes possible the famous RPN logic system—and a "Last X" memory.

Light-emitting diode display: Displays up to 10 significant digits, plus two-digit exponent and appropriate signs. Two selectable display modes: fixed point, with automatic overflow into scientific, and scientific with dynamic range of 1099 to 10⁻⁹⁹. Automatic decimal point positioning. Selective round-off: range: 0-9 decimal places. Flashing display indicates improper operation; flashing decimal points indicate low battery.

And an optional handbook

The HP-45 Applications Book documents the solutions to hundreds of common but complex problems in mathematics, statistics, finance, engineering, and navigation. This 218-page manual includes routines for number theory, algebra, geometry, trigonometry, statistics, numerical methods, bond calculations, loan repayments and more. Only $10.00.

Functions and features

Keyboard commands:

Trigonometric functions: 3 angular modes • Sin x • Arc sin x • Cos x • Arc cos x • Tan x • Arc tan x • Rectangular coordinates ↔ Polar coordinates • Decimal angle ↔ Angle in degrees/minutes/seconds • Decimal time ↔ Time in hours/minutes/seconds

Logarithmic functions: Log x • Ln x • eˣ • 10ˣ

Statistical functions: Mean and standard deviation (one variable) • Factorial • Positive and negative summation giving Σn, Σx, Σx², Σy

Metric conversion constants: cm/in • kg/lb • ltr/gal

Other functions: yˣ • √x • 1/x • π • x² • % • Δ% • Register arithmetic •

Addition, subtraction, multiplication or division in serial, mixed serial, chain or mixed chain calculations

Data storage and positioning operations: Data entry • Stack roll down • x, y interchange • Data storage • Data recall • Change sign • Exponent entry

Memory:
Four memory stack • "Last X" memory • Nine addressable memories

Specifications

AC: 115 or 230 V, ±10%, 50-60 Hz.
Battery: 3.75 Vdc. nickel-cadmium rechargeable battery pack.
Weight: HP-45: 255 g (9 oz) with battery pack • Recharger: 142 g (5 oz) • Shipping weight: approx. 900 g (2 lb).
Dimensions: Length: 14.7 cm (5.8 in) • Width: 8.1 cm (3.2 in) • Height: 1.8 to 3.3 cm (0.7 to 1.3 in).
Operating temperature range: 0° C to 50° C (32° F to 122° F).

The HP-45 outfit includes:

HP-45 Advanced Scientific Pocket Calculator • Rechargeable battery pack • Recharger/ac adapter • Soft carrying case • Illustrated Owner's Handbook • Quick Reference Guide

HP-45 Outfit $195.00

1.

It operates on pre-recorded program cards that turn complex or lengthy calculations into a few simple steps anyone can do quickly . . .

2.

Or you can actually program it yourself—without prior programming experience—to create your own highly specialized "answer machine" . . .

3.

And it's also an advanced scientific pocket calculator—with numerous functions already built in!

It's like having a "computer" in your pocket!

Only the HP-65 offers *full programmability* in a pocket calculator . . . because only the HP-65 can permanently store programs on tiny magnetic program cards.

It's the closest thing yet to a personal, portable computer!

Like a computer, the HP-65 accepts and memorizes programs (fed in via the keyboard or tiny, magnetic program cards) . . . it executes programs (up to 100 steps long) with just a few keystrokes . . . and it uses RPN logic to solve even extremely complex problems in seconds, with exceptional accuracy.

Once the HP-65 is programmed to solve a problem, you can run the program any number of times with different data. And since you can feed in a new program card in only two seconds, you can rapidly customize the HP-65 to meet your *specific* needs of the moment.

Yet you don't have to know a thing about computers to operate it!

The HP-65's programming system is based on the everyday English language. All the keys are labeled with either recognized symbols (*e.g.*, $\sqrt{x}$) or abbreviations for words or phrases (*e.g.*, "LBL" means "LABEL").

The program itself is usually nothing more than a normal keystroke sequence you would use to solve a problem with provisions for entering data.

And you can operate it anywhere—on rechargeable batteries or AC—to give you answers to complex problems *the moment you need them*. No computer—and certainly no ordinary calculator—can give you the portable power you get with the HP-65!

HP-65
Fully Programmable
The exceptionally versatile "personal computer" for science, engineering and business

13

1

Pre-recorded program cards quickly transform the HP-65 into a special-purpose calculator... to solve your complex problems at just the touch of a few keys.

Like a computer, the HP-65 can be programmed so that it goes through a step-by-step routine at just the touch of a few keys—to solve even extremely complex, lengthy or repetitve problems quickly, easily and accurately.

But instead of bulky reels of tape or stacks of keypunch cards, the HP-65 uses tiny, magnetic program cards, less than 1.3 by 7.6 cm in size.

Each card contains a program directing the HP-65 to perform a pre-determined routine, to solve a specific problem or series of problems.

A particular program can be a relatively simple or intricate sequence of steps. Each card stores a program of up to 100 steps. If a program greater than 100 steps is required, it may be stored on two or more program cards.

Because the program card has all of the steps pre-recorded, you only have to feed in the known data—the HP-65 will do the work!

Hundreds of pre-recorded program cards, packaged in Application Pacs (shown at left and listed on pages 18 and 19), are available from Hewlett-Packard. Each Pac contains up to 40 programs, plus a manual with step-by-step instructions for running each program.

Individual Application Pac programs, and programs contributed by HP-65 owners, are available through the HP-65 Users' Library (see page 17).

MEAN, STANDARD DEVIATION STANDARD ERROR				STD 02A
Σ+	x̄	Sₓ	S x̄	Σ−

ACTUAL SIZE

Here's how easy it is to operate the HP-65 with pre-recorded program cards
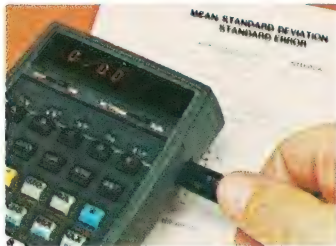
Select the card needed for the problem you're working and insert it into the HP-65's magnetic card reader. In less than two seconds . . .

. . . the card's entire program is duplicated in the HP-65's program memory. Then the card exits for further use at another time.

To identify the "User Definable Keys" (top row of the HP-65), insert the program card in the window slot directly above the keys.
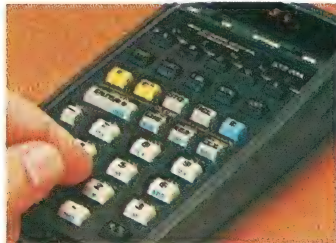
Key in your known data, and run the program as described in the instructions furnished for the program. No special training is required.
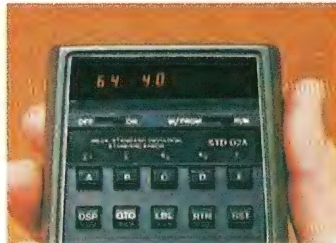
The HP-65 will give you the answer in just seconds, with accuracy up to 10 digits. And it's all done automatically!

To solve the same problem with different data, simply key in the new data and rerun the program. For other problems, insert different program cards.

2 Or you can create your own time-saving programs — without learning "computer language" — and save them on blank cards.

Since the HP-65 is a *personal* "computer," you can easily create your own program cards—and you don't have to learn "computer language" to do it!

Whatever your field, you can write programs (a keystroke sequence of up to 100 steps) incorporating the specific equations, constants and/or procedures you need, for easy and rapid calculation of all types of numeric problems. You can even incorporate any of the HP-65's powerful built-in functions, some of which are shown on the next page.

For repeated use, you can store your custom-made program on blank program cards (supplied). Then you —*or anyone*—can insert the card to customize the HP-65 to solve that specific problem.

Because entire sequences of keystrokes are stored as programs, then executed by merely pressing a few keys (to enter the data and run the program), the chance of manual keystroke error is substantially reduced. So in addition to saving time and effort, the HP-65 program cards greatly insure accuracy.

And it's easy to create your own program cards, using only the HP-65 and blank cards. Just follow the simple steps shown on this page.

Any program may be easily reviewed, and keystrokes can be added or deleted via the HP-65's unique editing capabilities.

Depending on your needs, a program can be simple or complex. If more than 100 steps are required for your program, just store the intermediate data in the HP-65's memory registers and use an additional program card. A program can even direct the HP-65 to make logical decisions, with the aid of one or two flags (described below), or to make any of four numeric comparison tests. Therefore, if you want to skip certain steps or branch to another part of the program—based on whether or not certain conditions are met—it can be done . . . *automatically*.

It does take time to write a program, but you need do it only once . . . you'll never have to rethink those solutions again. And you can create *all types* of programs.

The only limit is your imagination.

No separate keyboard needed... no key punching.

On a piece of paper, or a program form (supplied), make a step-by-step list of the keystrokes needed to solve your problem.

Then, with the HP-65 set in the "WRITE PROGRAM" mode, press the keys (except those for entering data) in the proper sequence.

The resulting program is stored in the program memory until the HP-65 is turned off, but can also be permanently recorded on a blank card.

Label the program card and insert it in the slot directly above the User Definable Keys to identify how they are to be used.

With the HP-65 set in the "RUN PROGRAM" mode, key in the known data for the problem you want to solve, and run the program.

You can change any part of the program by deleting keystrokes and adding new ones. Or clip a corner of the card to prevent erasure or modification.

These keyboard controls give you full programmability in a pocket calculator . . .

These keys take the HP-65 out of the realm of the calculator and into the sophisticated world of computer technology. They permit you to write, record, save and read back your programs. They also set in motion the HP-65's other powerful programming functions.

To write or run your program . . .

W/PRGM |||||||||| ▬▬ RUN

Set this switch to "WRITE PROGRAM" to enter or change any steps in the program memory and for recording programs, without altering any data stored in the four memory automatic stack or the addressable memories.

To structure your program . . .

[LBL] This "LABEL" key enables you to indicate and identify a series of steps within your program. Up to 15 labels are available by pressing this key and any digit (0-9) or letter (A-E) key.

[GTO] This "GO TO" key, in conjunction with a digit key, sets off a search in the program memory for the label with the same digit. It can be used from the keyboard when editing, or as part of a program.

[A] [B] [C] [D] [E]

These User Definable keys are just what their name implies. They are letter labels for parts of your program which can be executed directly from the keyboard. Or, they can be used to call a subroutine when used within a program.

[RTN] When this "RETURN" key is pressed, it enables you to start at the beginning of your program again. If this key is used as part of your stored program, it stops execution of your program and returns control to the keyboard for manual operation. When used as part of a letter subroutine, it returns control to the calling program.

[R/S] When this "RUN/STOP" key is included in your stored program, it will halt execution of the program and return control to the keyboard for manual operation. When used from the keyboard, it can stop a running program or start a stopped program at the next step.

To include conditional tests in your program . . .

SF1 SF2

Like a computer, the HP-65 can take alternate computational paths based on the condition of the two flags. With the "SET FLAG 1" and "SET FLAG 2" keys, the flags can be set or cleared manually from the keyboard or automatically by an appropriate program step.

TF1 TF2

The condition of the flags can be tested automatically at any point in your program by using these "TEST FLAG 1" and "TEST FLAG 2" keys to include an appropriate test flag instruction. Your program will either advance sequentially or skip over the next steps, depending on the condition of the tested flag.

[x≠y] [x≤y] [x=y] [x>y]

These keys allow you to compare the values in the X and Y registers. If the test condition is not met, the program skips over the next two steps. If the test condition is met, the program continues with the next step. This allows the HP-65 to perform conditional branches based on the results of the test.

[DSZ] The "DECREMENT AND SKIP ON ZERO" key subtracts a "1" from the integer previously stored in addressable memory 8, then advances your program depending on the value remaining in the memory. If the value in memory 8 is not equal to zero, the program advances to the next step. If it does equal zero, it skips the next two steps. "DSZ" allows you to loop through a portion of your program a pre-determined number of times.

[NOP] If this "NO OPERATION" key is included in your stored program, it will advance the program to the following step. It is often used in conjunction with conditional-skip instructions.

To edit your program . . .

PRGM

Use this "PROGRAM" key to clear the entire 100-step program memory, so you can begin keying in a new or revised program you have developed.

[DEL] This "DELETE" key erases a single program step and automatically moves the remaining steps up one place in the program memory to fill the resulting gap. To insert the corrected step, just key it in and the following steps will move down automatically.

[SST] When the HP-65 is in the "WRITE PROGRAM" mode, this "SINGLE STEP" key lets you step through each program instruction in the program memory, as the display shows a number for each step. This number represents the location (row and column) of the key corresponding to that particular instruction. For example, "34" refers to the key in row 3, column 4—"RCL." (Exception: digit keys are represented by the numbers 00 to 09.)

If the "SST" key is used with the HP-65 in the "RUN" mode, you can execute a program one step at a time.

3 The HP-65 is also an advanced scientific pocket calculator, with all these functions and features built in

"Shift" keys multiply the functions of many keys

| f | f-1 | g |
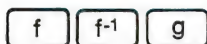
To save space, many of the built-in functions are shown on the keyboard as alternate functions, and are indicated either above a key (in gold) or on the front side of a key (in blue). To activate them, first press the appropriate prefix "shift" key. Note that f–1 performs the inverse of the labeled gold functions.

Advanced trigonometric capability

R → P

Coordinate conversions—Convert polar coordinates to rectangular coordinates, or vice versa. This lets you do vector arithmetic quickly and accurately.

| DEG | RAD | GRD |

Angle modes—You can calculate trig functions in any of three angular modes—degrees, radians or grads. You can also convert from an angle in one mode to an angle in another mode with a few keystrokes.

→ D.MS

Angle (time) conversions—In any of three angular modes, you can convert decimal angles (times) into angles (times) in degrees (hours)/minutes/seconds . . . or vice versa.

D.MS±

Angle (time) arithmetic—You can add or subtract angles (times) in degrees (hours)/minutes/seconds.

Other specialized functions

INT

Truncation—To truncate the displayed number to its integer value, press "f", then this key. To truncate it to a decimal fraction, first press "f–1". In this way you can save memory storage space by retaining two numbers within a single memory. This is often used in programs.

→ OCT

Octal conversion—Press the "f" key and this key to convert a decimal integer to octal. Press the "f-1" key first to convert an octal integer to decimal.

Advanced memory power for faster, easier problem-solving

In addition to the 100-step program memory, the HP-65 incorporates nine addressable memories.

These nine addressable memories make data manipulation easy. You can store data in any memory . . . retrieve data from any memory . . . and even do register arithmetic.

The addressable memories are not only useful when operating the HP-65 as a scientific calculator — to accumulate sums, or to store constants or intermediate results — but are equally useful when working with a program. Data may be stored in any memory, then retrieved — either manually or automatically, as part of a program.

Plus other quality HP features . . .

The HP-65 also includes a four memory stack, which makes possible the famous RPN logic system, and a "Last X" memory.

Light-emitting diode display— Displays up to 10 significant digits, plus two-digit exponent and appropriate signs. Two selectable display modes: fixed point, with automatic overflow into scientific notation, and scientific with a dynamic range of 1099 to 10⁻⁹⁹. Automatic decimal point positioning. Selective round-off; range: 0-9 decimal places.

Flashing display indicates improper operation; flashing decimal points indicate low battery.

Functions and features

Programming:

Magnetic card reader/writer • Program writing capability • Unique single-step, insert/delete editing features • $x \neq y$, $x \leq y$, $x = y$, $x > y$ relational tests for conditional branching • Direct branching • Built-in decrementer • Two flags for skip or no-skip programming or branching to another part of program • Five User Definable Keys • Subroutines (1 level) • 15 labels

Keyboard commands:

Trigonometric functions: 3 angular modes • Sin x • Arc sin x • Cos x • Arc cos x • Tan x • Arc tan x • Rectangular coordinates ↔ Polar coordinates • Decimal angle ↔ Angle in degrees/minutes/seconds • Decimal time ↔ Time in hours/minutes/seconds • Decimal angle ↔ Angle in degrees, radians or grads • Degrees (hours)/minutes/seconds arithmetic
Logarithmic functions: Log x • Ln x • eˣ • 10ˣ
Other functions: yˣ • √x • 1/x • π • x² n! • Integer/fraction truncation •

Register arithmetic • Addition, subtraction, multiplication or division in serial, mixed serial, chain or mixed chain calculations • Decimal ↔ Octal
Data storage and positioning operations: Data entry • Stack roll down and roll-up • x, y interchange • Data storage • Data recall • Change sign • Exponent entry

Memory:

Four-memory stack • "Last X" memory • Nine addressable memories • Program memory for storage of up to 100 keystrokes (a program).

Specifications:

AC: 115 or 230 V, ±10%, 50-60 Hz, 5 watts.
Battery: 3.75 Vdc nickel-cadmium rechargeable battery pack.
Weight: HP-65: 342 g (11 oz) with battery pack • Recharger: 142 g (5 oz) • Shipping weight: approx. 1.4 kg (3 lb).
Dimensions: Length: 15.24 cm (6 in) • Width: 8.1 cm (3.2 in) • Height: 1.8 to 3.4 cm (0.7 to 1.4 in).
Operating temperature range: 0° C to 40° C (32° F to 104° F).

The HP-65 outfit includes:

HP-65 Fully Programmable Pocket Calculator • Rechargeable battery pack • 115 or 230 Vac adapter/recharger • Soft carrying case • Safety travel case • Illustrated Owner's Handbook • Quick Reference Guide • Pad of programming worksheets • Standard Pac of pre-recorded program cards (see page 17) • "Key Note" newsletter and Users' Library Catalog subscriptions (see page 17).

HP-65 Outfit $795⁰⁰

These three HP-65 extras extend the versatility of the calculator at no extra charge...

When you purchase the HP-65 Fully Programmable Pocket Calculator, it's just the beginning of a working relationship that can last a lifetime... with new and fantastic capabilities unveiled with regularity.

On the first day, you are introduced to the HP-65's remarkable versatility via the Standard Application Pac— a selection of pre-recorded program cards that demonstrate the versatility of the "pocket computer."

You are also entitled to a one-year subscription to the Catalog of Contributed Programs—an introduction to the HP-65 Users' Library—and a subscription to Key Note, the HP-65 newsletter.

The Standard Pac, the Catalog and the Key Note subscription are yours without extra cost when you purchase the HP-65.

1. You start with the Standard Pac

... a sampling of 17 pre-recorded program cards, plus three other cards to help insure the smooth operation of the HP-65. The pre-recorded cards are:
- Day of the week
- Mean, standard deviation, standard error
- Great circle navigation
- Integer base conversion
- Body surface area (Boyd)
- Pi network impedance matching
- EDM slope reduction—given elevation
- Temperature conversion
- Weight-mass conversion
- Volume conversions
- Compound interest
- Loan repayment
- Reconcile checking account
- Iterative solution of f(x)=0
- Quadratic equation
- Areas and solutions of right triangle
- The game of NIMB (a game of logic you play against the HP-65)

Plus two diagnostic cards:
- User diagnostic program I
- User diagnostic program II

These two cards check the operating condition of the HP-65.

Also included is a special card to (occasionally) clean the program read/write head of the HP-65, and 20 blank program cards for do-it-yourself programming. Included, too, is a detailed manual on the Standard Pac, plus a set of 20 two-sided blank Pocket Instruction Cards (each having room for two program cards and their program instructions).

2. You're welcomed to the HP-65 Users' Library *

... and given a subscription to the Catalog of Contributed Programs. The Users' Library contains thousands of programs—from a wide range of fields and application areas—contributed by HP-65 users, in addition to those developed and tested by Hewlett-Packard.

All of the programs are listed and described in the Catalog of Contributed Programs, which is periodically updated. This sectionalized catalog makes it easy to select the particular program that will help you quickly obtain the answer(s) to your specific problem. The Catalog is indexed according to application area, key word and author.

In addition, there is a section containing a short abstract of each program. The abstract provides information to help you determine whether a particular program will meet your needs, or you can use it to compare programs against each other when selecting between two or more alternatives.

Any of the programs listed in the Catalog may be ordered from Hewlett-Packard, and—if you wish—you may record them on blank program cards for repeated use.

3. You also receive a subscription to "Key Note" *

... the HP-65 newsletter which will keep you abreast of current information to help you get the most out of your "pocket computer."

Key Note, published quarterly, announces new Application Pacs, describes new HP-65 accessories, passes along programming hints, and carries other news and information of interest to HP-65 users. Also, frequently-asked questions about the HP-65 will be answered in Key Note. (This is in addition to the continuing program of information and assistance available from HP on a one-to-one basis, via the phone or by mail, at no charge.)

and here's what you can add ▶ ▶ ▶

The HP-65
can be "tailor made" for your profession.

These programs let you transform your HP-65 into a specialized calculator–in seconds.

To concentrate the capabilities of the HP-65 in your field of interest, you can select from an ever-expanding variety of pre-recorded magnetic program cards packaged in Application Pacs. Each Pac contains cards for up to 40 programs, a detailed manual on the Pac, and a set of Pocket Instruction Cards for listing your program instructions.

FINANCE PAC 1

These 38 programs (on 40 pre-recorded cards) help give you fast answers to complex problems in investment analysis, loans, leasing, savings and annuities, business statistics and other business and financial applications. Included are programs for:

- COMPOUND AMOUNT
- DIRECT REDUCTION LOAN
- DIRECT REDUCTION LOAN WITH BALLOON PAYMENT
- SINKING FUND

Other programs are:
- PERIODIC SAVINGS, ANNUITY DUE
- PRESENT VALUE, ANNUITY DUE
- PRESENT VALUE, ANNUITY DUE WITH BALLOON PAYMENT
- SAVINGS-COMPOUNDING PERIODS DIFFERENT FROM PAYMENT PERIODS
- NOMINAL TO EFFECTIVE/EFFECTIVE TO NOMINAL RATE CONVERSION
- DIRECT REDUCTION LOAN; ACCUMULATED INTEREST/REMAINING BALANCE
- DIRECT REDUCTION LOAN; AMORTIZATION SCHEDULE
- ADD-ON RATE INSTALLMENT LOAN
- CONSTANT PAYMENT TO PRINCIPAL LOAN AMORTIZATION SCHEDULE
- INTEREST REBATE – RULE OF 78'S
- INTERNAL RATE OF RETURN, UNEVEN CASH FLOWS
- DISCOUNTED CASH FLOW ANALYSIS, NET PRESENT VALUE
- STRAIGHT LINE DEPRECIATION SCHEDULE
- SUM-OF-THE YEAR'S DIGITS DEPRECIATION SCHEDULE
- VARIABLE RATE DECLINING BALANCE DEPRECIATION SCHEDULE
- CROSSOVER POINT-DECLINING BALANCE TO STRAIGHT LINE
- DAYS BETWEEN DATES
- BOND PRICE AND YIELD
- ACCRUED SIMPLE INTEREST
- LINEAR REGRESSION (Trend Line)
- EXPONENTIAL CURVE FIT (Growth Curve)
- TOTAL, AVERAGE AND PERCENT OF TOTAL
- MOVING AVERAGES
- INVOICING

00065-67044 . . . . **$45.00**

MATH PAC 1

This basic series of 40 programs (on 40 pre-recorded cards) speeds the handling of problems in algebra, trigonometry, analytic geometry and calculus. It covers:

- HYPERBOLIC FUNCTIONS
- FIRST ORDER DIFFERENTIAL EQUATION
- SOLUTION OF A TRIANGLE (Given a, b, c or a, b, C)
- 3 x 3 MATRIX INVERSION
- FIFTH DEGREE POLYNOMIAL EQUATION
- FACTORS OF AN INTEGER

Other programs are:
- GREATEST COMMON DIVISOR, LEAST COMMON MULTIPLE
- ARITHMETIC AND HARMONIC PROGRESSIONS
- GEOMETRIC PROGRESSION
- FUNCTIONS OF x AND y
- QUADRATIC EQUATION
- CUBIC EQUATION
- FOURTH DEGREE POLYNOMIAL EQUATION
- SIMULTANEOUS EQUATIONS IN TWO UNKNOWNS
- SIMULTANEOUS EQUATIONS IN THREE UNKNOWNS
- SYNTHETIC DIVISION
- RECTANGULAR, SPHERICAL CONVERSIONS
- TRANSLATION AND/OR ROTATION OF COORDINATE AXES
- ANGLE CONVERSIONS
- SECONDARY VALUES OF $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$
- TRIGONOMETRIC FUNCTIONS
- INVERSE HYPERBOLIC FUNCTIONS
- SOLUTION OF A TRIANGLE (GIVEN a, A, C or a, B, C)
- SOLUTION OF A TRIANGLE (GIVEN B, b, c)
- SPHERICAL TRIANGLES
- AREA OF A TRIANGLE
- AREA OF A POLYGON
- CIRCLE DETERMINED BY THREE POINTS
- EQUALLY SPACED POINTS ON A CIRCLE
- POLYGONS INSCRIBED IN AND CIRCUMSCRIBED ABOUT A CIRCLE
- UNIT CONVERSIONS: C →F; ft, in → cm; lb →kg
- UNIT CONVERSIONS: mi →km; gal → ltr; yd →m; ac →ft²
- POLYNOMIAL EVALUATION (Real)
- LINEAR AND LAGRANGIAN INTERPOLATIONS
- FINITE DIFFERENCE INTERPOLATION
- NUMERICAL INTEGRATION (Discrete Case)
- SIMPSON'S RULE FOR NUMERICAL INTEGRATION
- ROOTS OF f(X)=0 IN AN INTERVAL
- DETERMINANT AND CHARACTERISTIC EQUATION OF A 3 x 3 MATRIX
- 2 x 2 MATRIX OPERATIONS

00065-67001 . . . . **$45.00**

MATH PAC 2

A variety of advanced mathematical functions is provided by the 37 programs (40 pre-recorded cards) in this Pac. The programs are:

- BASE CONVERSION
- COMPLEX FUNCTIONS |z|, z^2, $\sqrt{z}$, $1/z$
- GAUSSIAN QUADRATURE FOR $\int_a^b f(x)dx$
- BESSEL FUNCTION $J_n(x)$
- COMPLETE ELLIPTIC INTEGRALS

Other programs are:
- COMPLEX ARITHMETIC
- COMPLEX TRIGONOMETRIC AND HYPERBOLIC FUNCTIONS
- COMPLEX INVERSE TRIGONOMETRIC AND HYPERBOLIC FUNCTIONS
- OCTAL ARITHMETIC
- INTEGER BASE CONVERSION
- COMPLEX FUNCTIONS z^n, $z^{1/n}$
- COMPLEX FUNCTIONS e^z, ln z, a^z, $\log_a z$
- COMPLEX FUNCTIONS z^w, $z^{1/w}$, $\log_z w$
- POLYNOMIAL EVALUATION (Complex)
- INTERSECTIONS OF A LINE AND A CONIC SECTION
- VECTOR PRODUCTS AND ANGLE BETWEEN VECTORS
- PARTIAL SUM AND PARTIAL PRODUCT
- GAUSSIAN QUADRATURE FOR $\int_a^\infty f(x)dx$
- KELVIN FUNCTIONS
- EULER Φ FUNCTION
- GAMMA FUNCTION
- INCOMPLETE GAMMA FUNCTION
- ERROR FUNCTION AND COMPLEMENTARY ERROR FUNCTION
- CONFLUENT HYPERGEOMETRIC FUNCTION
- GAUSSIAN HYPERGEOMETRIC FUNCTION
- CHEBYSHEV POLYNOMIAL
- LEGENDRE POLYNOMIAL
- HERMITE POLYNOMIAL
- LAGUERRE POLYNOMIAL
- SINE INTEGRAL
- COSINE INTEGRAL
- EXPONENTIAL INTEGRAL
- FRESNEL INTEGRALS

00065-67002 . . . . **$45.00**
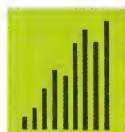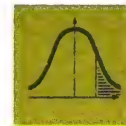
STAT PAC 1

Basic and advanced functions – 37 programs (40 pre-recorded cards) – selected from the areas of general statistics; distribution functions; curve fittings; and test statistics. Programs included in this Pac are:

- MEAN, STANDARD DEVIATION, STANDARD ERROR
- RANDOM NUMBER GENERATOR
- ANALYSIS OF VARIANCE (One Way)
- MULTIPLE LINEAR REGRESSION
- 2 x k CONTINGENCY TABLE
- SUMS FOR TWO VARIABLES
- BASIC STATISTICS (Two Variables)

Other programs are:
- MEAN, STANDARD DEVIATION, STANDARD ERROR (Grouped Data)
- PERMUTATION AND COMBINATION ARITHMETIC, GEOMETRIC, HARMONIC AND GENERALIZED MEANS
- MOMENTS, SKEWNESS AND KURTOSIS (Grouped or Ungrouped Data)

NORMAL DISTRIBUTION
- NORMAL DISTRIBUTION
- INVERSE NORMAL INTEGRAL
- CHI-SQUARE DISTRIBUTION
- t DISTRIBUTION
- F DISTRIBUTION
- BIVARIATE NORMAL DISTRIBUTION
- LOGARITHMIC NORMAL DISTRIBUTION
- WEIBULL DISTRIBUTION
- BINOMIAL DISTRIBUTION
- NEGATIVE BINOMIAL DISTRIBUTION
- HYPERGEOMETRIC DISTRIBUTION
- POISSON DISTRIBUTION
- LINEAR REGRESSION
- EXPONENTIAL CURVE FIT
- POWER CURVE FIT
- LOGARITHMIC CURVE FIT
- LEAST SQUARES REGRESSION OF $y = cx^a + dx^b$
- PARABOLIC CURVE FIT
- PAIRED t STATISTIC
- t STATISTIC FOR TWO MEANS
- CHI-SQUARE EVALUATION
- BARTLETT'S CHI-SQUARE STATISTIC
- SPEARMAN'S RANK CORRELATION COEFFICIENT
- MANN-WHITNEY STATISTIC
- KENDALL'S COEFFICIENT OF CONCORDANCE
- BISERIAL CORRELATION COEFFICIENT

00065-67005 . . . . **$45.00**

STAT PAC 2

Thirty-one programs (40 pre-recorded cards) provide solutions in the areas of general statistics, distribution functions, curve fitting, analysis of variance, test statistics, probability, quality control, and queuing theory.

- PARTIAL AND MULTIPLE CORRELATION COEFFICIENTS
- MOVING AVERAGES (Order 2 to 8)
- HISTOGRAM (12 Intervals)
- F DISTRIBUTION WITH ODD DEGREES OF FREEDOM
- ERLANG DISTRIBUTION (Gamma Distribution)
- GEOMETRIC CURVE FIT
- GOMPERTZ CURVE FIT
- WEIBULL DISTRIBUTION PARAMETER CALCULATION
- WEIGHTED REGRESSION (Special Case)
- POLYNOMIAL APPROXIMATION
- TWO WAY ANALYSIS OF VARIANCE (No Replications)
- TWO WAY ANALYSIS OF VARIANCE (With Replications)
- LATIN SQUARE
- ANALYSIS OF COVARIANCE (One Way)
- ONE SAMPLE TEST STATISTICS FOR THE MEAN
- TEST STATISTICS FOR THE CORRELATION COEFFICIENT
- DIFFERENCES AMONG PROPORTIONS
- BEHRENS-FISHER STATISTIC
- KRUSKAL-WALLIS STATISTIC
- MEAN-SQUARE SUCCESSIVE DIFFERENCE
- 3 x K CONTINGENCY TABLE
- THE RUN TEST FOR RANDOMNESS
- INTRACLASS CORRELATION COEFFICIENT
- FISHER'S EXACT TEST FOR A 2 x 2 CONTINGENCY TABLE
- PROBABILITY OF NO REPETITIONS IN A SAMPLE (Birthday Problem)
- $\bar{x}$ and R CONTROL CHARTS
- p AND c CONTROL CHARTS
- OPERATING CHARACTERISTIC CURVE (Type A)
- OPERATING CHARACTERISTIC CURVE (Type B)
- SINGLE - AND MULTI-SERVER QUEUES (Infinite Customers)
- SINGLE - AND MULTI-SERVER QUEUES (Finite Customers)

00065-67053 . . . . **$45.00**
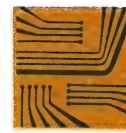
EE PAC 1

Thirty-five programs (40 pre-recorded cards) provide functions for use in electronic and electrical engineering projects. Topics addressed include impedance matching filter design; transmission line calculation; parameter conversion; power supply design; transistor biasing; control system and waveform analyses. The programs are:

- REACTANCE CHART
- IMPEDANCE OF LADDER NETWORK
- TRANSMISSION LINE IMPEDANCE TRANSFORMATION
- S⇄Y PARAMETER CONVERSION
- FOURIER SERIES

Other programs are:
- SERIES RESONANT CIRCUIT
- PARALLEL RESONANT CIRCUIT
- T ATTENUATOR
- PI ATTENUATOR
- WYE-DELTA OR DELTA-WYE TRANSFORMATION
- MINIMUM-LOSS PAD MATCHING
- PI NETWORK IMPEDANCE MATCHING
- BAND PASS FILTER DESIGN
- ACTIVE FILTER – LOW PASS
- ACTIVE FILTER – HIGH PASS
- BUTTERWORTH FILTER
- CHEBYSHEV FILTER
- CAPACITANCE OF PARALLEL PLATES
- SELF-INDUCTANCE OF STRAIGHT ROUND WIRE
- INDUCTANCE OF A SINGLE-LAYER CLOSE-WOUND COIL
- SKIN EFFECT AND COIL Q
- TRANSFORMER DESIGN
- REED RELAY DESIGN
- IMPEDANCE OF TRANSMISSION LINE
- MICROSTRIP TRANSMISSION LINE
- POWER SUPPLY DESIGN CIRCUITS
- CONTROLLED RECTIFIER CIRCUITS
- INTEGRATED CIRCUIT CURRENT SOURCE
- TRANSISTOR BIAS
- JFET BIAS AND TRANSCONDUCTANCE
- PHASE-LOCKED LOOP
- DECIBEL CONVERSION
- VOLTAGE TO dBm
- WIRE TABLES Al & ANNEALED Cu
- HEAT SINKS

00065-67007 . . . . **$45.00**

EE PAC 2 (Microwave)

Twenty-seven programs (40 pre-recorded cards) will assist the microwave circuit designer in making microwave measurements, designing transistor amplifiers, computing transmission line properties and certain system properties, and performing difficult related mathematical operations.

- MISMATCH ERROR LIMITS
- MULTIPLE MISMATCH ERROR LIMITS
- SMITH CHART: RADIALLY SCALED PARAMETERS
- SMITH CHART: IMPEDANCE ⇄ REFLECTION COEFFICIENT
- MICROSTRIP CALCULATIONS (three cards)
- TRANSMISSION LINE CALCULATIONS (three cards)

Column 1

- CUTOFF FREQUENCY IN COAX
- RECTANGULAR WAVEGUIDE CALCULATIONS
- FREQUENCY CONVERSIONS
- PULSE SPECTRUM ANALYSIS
- SPURIOUS RESPONSES
- FM SIDEBAND LEVEL
- MODULATION INDEX FOR SPECIFIED CARRIER SUPPRESSION
- CONSTANT-EXCESS NOISE MEASUREMENT
- NOISE FIGURE OF CASCADED NETWORKS
- IMPEDANCE MATCHING
- UNILATERAL DESIGN: FIGURE OF MERIT, MAXIMUM UNILATERAL GAIN
- UNILATERAL DESIGN: GAIN CIRCLES
- UNILATERAL DESIGN: NOISE FIGURE CIRCLES
- BILATARAL DESIGN: STABILITY FACTOR, MAXIMUM GAIN, OPTIMUM MATCHING (three cards)
- BILATERAL DESIGN: GAIN CIRCLES
- BILATERAL DESIGN: STABILITY CIRCLES
- LOAD AND SOURCE MAPPING
- LINEAR AND LAGRANGIAN INTERPOLATION
- PARAMETER CONVERSION: $S \rightleftarrows Y, Z, G, H$ (six cards)
- PARAMETER CONVERSION: $S \rightleftarrows T$ (two cards)
- COMPLEX MATRIX OPERATIONS (two cards)

00065-67056 . . . . **$45.00**
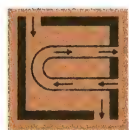
CHEMICAL ENGINEERING PAC 1 (Thermal and Transport Science)

18 programs (on 40 pre-recorded cards) designed to aid the engineer in thermodynamic and transport process calculations. Topics addressed include P-V-T gas relations, gas dynamics, incompressible flow, heat exchangers, heat conduction, black body radiation, and curve fitting.

- IDEAL GAS EQUATION OF STATE
- REDLICH—KWONG EQUATION OF STATE
- REVERSIBLE POLYTROPIC PROCESS FOR AN IDEAL GAS
- ISENTROPIC FLOW FOR IDEAL GASES
- ONE DIMENSIONAL NORMAL SHOCKS FOR IDEAL GASES

Other programs are:
- FLUID TRANSPORT NUMBERS (NUSSELT—HEAT & MASS, REYNOLDS, STANTON, LEWIS, SCHMIDT, BIOT, AND PRANDTL)
- FANNING FRICTION FACTOR AND CONDUIT FLOW
- CONSERVATION OF ENERGY
- VON KÁRMÁN ANALOGY FOR HEAT AND MASS TRANSFER
- HEAT EXCHANGER ANALYSIS (HEAT TRANSFER AND EFFECTIVENESS FOR CROSS-FLOW, COUNTER-FLOW, PARALLEL-FLOW AND PARALLEL-COUNTER-FLOW HEAT EXCHANGERS)
- HEAT TRANSFER THROUGH COMPOSITE CYLINDERS AND WALLS
- STRAIGHT FIN EFFICIENCY
- NATURAL CONVECTION (ESTIMATE COEFFICIENTS FOR VERTICAL CYLINDERS AND WALLS, AND HORIZONTAL CYLINDERS AND PLATES)
- BLACK BODY THERMAL RADIATION TEMPERATURE OR CONCENTRATION PROFILE FOR A SEMI-INFINITE SOLID
- HYDROCARBON COMBUSTION
- CURVE FITTING (LINEAR, EXPONENTIAL, AND POWER)
- UNIT CONVERSIONS

00065-67050 . . . . **$45.00**

Column 2

STRESS ANALYSIS PAC 1

25 programs (on 39 pre-recorded cards) designed to aid the engineer in the calculation of the properties of structural elements. Topics addressed include vector statics, section properties, interference fits, stress analysis, flat plates, beams and columns. Programs included in this Pac are:

- TWO DIMENSIONAL VECTOR OPERATIONS
- STATIC EQUILIBRIUM OF A POINT
- STATIC EQUILIBRIUM OF A RIGID BODY

Other programs are:
- PROPERTIES OF RECTANGULAR SECTIONS
- PROPERTIES OF CIRCULAR SECTIONS
- PROPERTIES OF ANNULAR SECTIONS
- COMPOSITE SECTION PROPERTIES
- BENDING STRESS IN BEAMS OR TORSIONAL SHEAR STRESS IN CIRCULAR SHAFTS
- LINEAR OR ANGULAR DEFORMATION OF A SHAFT
- THIN-WALLED PRESSURE VESSELS
- STRESS IN THICK-WALLED CYLINDERS
- INTERFERENCE FITS
- MOHR CIRCLE FOR STRESS
- SODERBERG'S EQUATION FOR FATIGUE
- CIRCULAR PLATES WITH SIMPLY SUPPORTED EDGES
- CIRCULAR PLATES WITH FIXED EDGES
- RECTANGULAR PLATES (SIMPLY SUPPORTED AND WITH FIXED EDGES)
- COMPRESSIVE BUCKLING
- ECCENTRICALLY LOADED COLUMNS
- RECTANGULAR, REINFORCED CONCRETE SECTIONS
- BOLT TORQUE

The next four programs calculate deflection, slope, moment, and shear for various beam geometries.

- CANTILEVER BEAMS
- SIMPLY SUPPORTED BEAMS
- BEAMS FIXED AT BOTH ENDS
- BEAMS FIXED AT ONE END AND SIMPLY SUPPORTED AT THE OTHER

00065-67051 . . . . **$45.00**

SURVEYING PAC 1

Because surveying practices differ from country to country, different versions are offered. Contact your local Hewlett-Packard sales office for the exact contents of Surveying Pac 1 in your country. The U.S. version consists of 34 programs (on 34 pre-recorded cards) dealing with traversing; curves; triangles and intersections; pre-determined area; and earthwork.

- FIELD ANGLE TRAVERSE
- HORIZONTAL CURVE LAYOUT
- BEARING-DISTANCE INTERSECT
- STADIA REDUCTIONS
- VOLUME BY AVERAGE END AREA

Other programs are:
- BEARING TRAVERSE
- CLOSURE FOR FIELD ANGLE AND BEARING TRAVERSES
- INVERSE FROM COORDINATES
- SIDESHOTS
- COORDINATE TRANSFORMATION

Column 3

- COMPASS RULE ADJUSTMENT
- TRANSIT RULE ADJUSTMENT
- TWO INSTRUMENT RADIAL SURVEY
- CURVE SOLUTION — Given $\triangle$ & R or $\triangle$ & T
- CURVE SOLUTION — Given R & T or R & L
- CURVE SOLUTION — Given $\triangle$ & C or R & C
- ELEVATIONS ALONG A VERTICAL CURVE
- TRIANGLE SOLUTION — Given SSS or SAS
- TRIANGLE SOLUTION — Given SSA
- TRIANGLE SOLUTION — Given ASA or AAS
- BEARING-BEARING INTERSECT
- DISTANCE-DISTANCE INTERSECT
- DISTANCE FROM A POINT TO A LINE
- TAPING CORRECTIONS
- EDM SLOPE REDUCTION — Given Zenith Angle
- EDM SLOPE REDUCTION — Given $\triangle$ Elevation
- FIELD ANGLE CHECK
- THREE WIRE LEVELING
- SLOPE STAKING — Given Centerline Terrain Elevation
- SLOPE STAKING -- Given Centerline Cut/Fill
- AZIMUTH OF THE SUN
- PREDETERMINED AREA — Line Through a Point
- PREDETERMINED AREA — Two Sides Parallel
- VOLUME OF BORROW PIT

00065-67003 . . . . **$45.00**

MACHINE DESIGN PAC 1

Thirty-five programs (40 pre-recorded cards) provide solutions for the machine designer in dynamics, vibrations, linkages, cams, gears, springs, power transmission, and machine geometries.

- CONSTANT ACCELERATION — TIME
- CONSTANT ACCELERATION — VELOCITY
- KINETIC ENERGY
- FREE VIBRATIONS
- VIBRATION FORCED BY $F_o \cos \omega t$
- FORCED OSCILLATOR WITH ARBITARY FUNCTION
- FOURIER SERIES
- CRITICAL SHAFT SPEED
- FOUR BAR FUNCTION GENERATOR
- PROGRESSION OF FOUR BAR SYSTEM
- LINEAR PROGRESSION OF SLIDER CRANK
- ANGULAR PROGRESSION OF SLIDER CRANK
- CAM DATA STORAGE
- HARMONIC CAM DESIGN — RADIAL ROLLER FOLLOWER
- HARMONIC CAM DESIGN — FLAT FACED FOLLOWER
- ROLLER FOLLOWER CAM FUNCTION GENERATOR
- FLAT FACED FOLLOWER CAM FUNCTION GENERATOR
- LINEAR CAM FUNCTION GENERATOR
- SPUR GEAR REDUCTION DRIVE
- STANDARD EXTERNAL INVOLUTE SPUR GEARS
- SPUR/HELICAL GEAR FORCES
- BEVEL GEAR FORCES
- WORM GEAR FORCES
- SPRING CONSTANT
- HELICAL SPRING DESIGN
- TORSION SPRING DESIGN
- FLAT SPRING DESIGN

Column 4

- CONE AND PLATE CLUTCHES
- POWER SCREWS
- RPM/TORQUE/POWER
- LINE — LINE INTERSECTION/GRID POINTS
- CIRCLE — LINE INTERSECTION
- CIRCLE — CIRCLE INTERSECTION
- POINTS ON A CIRCLE
- BELT LENGTH

00065-67052 . . . . **$45.00**

MEDICAL PAC 1

This Pac of 27 programs (38 pre-recorded cards) allows for the following types of medical calculations: unit conversions; ventilator set-up and calibration; analysis of cardio-pulmonary function; acid-base balance, blood gases; and respiratory status. The Pac contains:

- WEIGHT CONVERSIONS
- LENGTH CONVERSIONS
- VOLUME CONVERSIONS
- ENGLISH-METRIC CONVERSIONS
- PATIENT IDENTIFICATION

Other programs are:
- MALE PULMONARY FUNCTIONS
- FEMALE PULMONARY FUNCTIONS
- LUNG DIFFUSION
- RESPIRATORY GAS CONVERSIONS
- VENTILATOR SETUP
- $PaCO_2$ NORMALIZATION
- BLOOD ACID-BASE STATUS
- VIRTUAL PO_2
- OXYGEN SATURATION AND CONTENT
- ANAEROBIC PCO_2 AND pH CHANGE
- ANAEROBIC PO_2 CHANGE
- DEAD SPACE FRACTION
- A-a O_2 DIFFERENCE
- PHYSIOLOGIC SHUNT AND FICK
- DUBOIS BODY SURFACE AREA
- BOYD BODY SURFACE AREA
- DYE CARDIAC OUTPUT
- FICK CARDIAC OUTPUT
- VALVE AREA
- ANATOMIC SHUNTS
- CONTRACTILITY
- STROKE WORK

00065-67004 . . . . **$45.00**

AVIATION PAC 1

Here are 29 programs (31 cards) for flight and preflight calculations — primarily for the private and business pilot, but also being used by many airline pilots. Included are:

- AIRCRAFT FLIGHT PLAN WITH WIND
- FLIGHT MANAGEMENT
- PREDICTING FREEZING LEVELS
- GENERAL AIRCRAFT WEIGHT AND BALANCE
- CUSTOMIZED WEIGHT AND BALANCE
- TURN PERFORMANCE

Other programs are:
- RATE OF CLIMB AND DESCENT
- HEAD WINDS AND CROSSWINDS
- FLIGHT PLANNING AND FLIGHT VERIFICATION
- DETERMINING IN-FLIGHT WINDS
- STANDARD ATMOSPHERE (For altitudes 0-36089 and 36089-82000)
- MACH NUMBER AND TRUE AIRSPEED
- TRUE AIR TEMPERATURE AND DENSITY ALTITUDE
- LOWEST USABLE FLIGHT LEVEL
- GREAT CIRCLE PLOTTING
- RHUMBLINE NAVIGATION

Column 5

- GREAT CIRCLE NAVIGATION
- POSITION, GIVEN HEADING, SPEED AND TIME
- LINE OF SIGHT DISTANCE
- POSITION BY TWO VORS
- NAVIGATION BY TWO VORS
- POSITION BY ONE VOR
- DME SPEED CORRECTION
- AVERAGE WIND VECTOR
- COURSE CORRECTION
- TIME OF SUNRISE AND SUNSET
- AZIMUTH OF SUNRISE AND SUNSET
- PILOT UNIT CONVERSIONS
- CUSTOMIZED UNIT CONVERSIONS

00065-67042 . . . . **$45.00**

NAVIGATION PAC 1

Written for marine navigators but also useful to the land or air navigator, these 26 programs (40 cards) assist the navigator in piloting, dead reckoning, celestial navigation, and relative motion problems. The Pac includes:

- GREAT CIRCLE COMPUTATION
- LONG-TERM ARIES ALMANAC
- 1974-1975 SUN ALMANAC
- LONG-TERM STAR ALMANAC
- ALMANAC POSITIONS
- SIGHT REDUCTION TABLE
- MANEUVERING RELATIVE TO ANOTHER VESSEL

Other programs are:
- LENGTH CONVERSIONS
- SPEED, TIME, AND DISTANCE
- TIME-ARC CONVERSION
- PROPELLER SLIP
- FUEL CONSUMPTION
- DISTANCE TO OR BEYOND HORIZON
- DISTANCE BY HORIZON ANGLE AND DISTANCE SHORT OF HORIZON
- DEAD RECKONING
- RHUMBLINE NAVIGATION
- GREAT CIRCLE NAVIGATION
- COMPOSITE SAILING
- SEXTANT ALTITUDE CORRECTIONS
- SUNRISE, SUNSET, AND TWILIGHT
- MOST PROBABLE POSITION
- FIX BY TWO OBSERVATIONS
- FIX BY THREE OBSERVATIONS
- DISTANCE OF AN OBJECT BY TWO BEARINGS
- VECTOR ADDITION
- VELOCITY TO CHANGE RELATIVE POSITION

00065-67045 . . . . **$45.00**

BLANK PROGRAM CARDS

So that you may customize the HP-65's capabilities even more, these blank magnetic cards can be used to store programs of up to 100 steps, then used again and again for problem-solving. Each card may be "erased" to record different programs, or a corner clipped for permanency.

00065-67010 (40 cards) **$25.00**
00065-67054 (120 cards) **$50.00**

All Hewlett-Packard pocket calculators feature RPN logic—the most sensible logic system a pocket calculator can have!

In 1967, Hewlett-Packard began designing a family of computer calculators—powerful enough to solve complex engineering, scientific and business problems, yet simple enough to be used by anyone who works with numbers.

As part of this effort, HP thoroughly evaluated the strengths and weaknesses of the various logic systems which a person might use to communicate with an electronic calculator.

Algebraic logic, for example, was in more common use and worked well with simple calculations, but when working complex problems it was often necessary to restructure the equation.

So, after much testing and evaluation, Hewlett-Packard selected a parenthesis-free but unambiguous logic system derived from the one developed by a mathematician named Jan Lukasiewicz. It's known as "RPN" logic, and all HP pocket calculators use it.

RPN is the simplest, most efficient, most consistent way to solve mathematical problems, because it reduces even the most complex problems to a relatively few, easily-handled steps. It gives you confidence in your computations.

The RPN logic system is only possible because HP pocket calculators incorporate a four memory stack. This is symbolized in the photo at left and completely explained in every HP Owner's Handbook.

Numbers that are keyed in, as well as intermediate answers, are automatically stored here, for review or to use again in subsequent calculations.

A fifth memory—the "Last X" memory—is also incorporated into HP's advanced scientific calculators. It stores the last input argument (the number keyed in just before the function is pressed), for review or other operation.

T

Z

Y

X

LAST X

No "=" key is needed

If you will look at the keyboard of any HP calculator shown in this catalog, you will see that none has an "=" key. Nor are there any keys for parentheses. None are needed.

Instead, all HP calculators have a key like this:

ENTER↑

Thanks to this key, and RPN logic, you get four major advantages you don't get with most other calculators:

1. You work with only two numbers at a time, just as if you were solving the problem with paper and pencil. (Only incredibly faster.)

Even the most complex problems are broken down into a series of easily-handled two-number problems, which you can solve in any order that's convenient—left to right, right to left, or from the middle of the equation outwards.

No matter what kind of problem it is, there's no restructuring to do ... no rearranging of the equation as is so often necessary with other calculators, to conform to algebraic logic.

So there's less confusion and less chance for error.

2. The function is immediately calculated.

With an HP calculator, pressing the function key initiates the desired action, so you get your answer immediately.

For example, to find the square root of 16, simply press three keys ...

1 6 √x

... and your answer immediately appears on the display ...

4.00

And it's just as fast and easy to calculate squares, cosines, factorials or other functions.

3. The intermediate answer is displayed.

This enables you to check your calculation every step of the way ... so you can do something about it if it doesn't look "right."

4. The intermediate answer is automatically stored.

So there's no need to store it manually, by keying in each digit, if the number is needed in the next calculation.

Obviously, this saves keystrokes and helps prevent errors. And you can easily recall the intermediate answer if need be.

Four major advantages — to give you *confidence in your computations.*

Just four simple steps

To use any Hewlett-Packard pocket calculator, just follow these four simple steps ...

1. **Key in the first number.**
2. **Enter it into the stack (press the "ENTER ↑" key).**
3. **Key in the second number.**
4. **Press the function key.**

And if your numbers are already stored in the calculator as intermediate answers, all you have to do is hit the function key.

Could anything be easier ... or faster?

Here's an example

Let's take a simple problem— 2.5 x 4—and solve it with an HP calculator, using the four steps shown above ...

1. Key in the first number:

2 · 5

2. Enter it into the stack:

ENTER↑

3. Key in the second number:

4

4. Press the function key:

x

Your answer appears on the display:

10.00

Now let's try a slightly more difficult problem:
(2 + 6) x (9 — 3.5).

If you were working this out with paper and pencil, you'd probably work from left to right and first solve for (2 + 6). Then you'd solve for (9 — 3.5). Finally, you'd multiply the two answers—8 x 5.5—and get 44.

Well, with an HP pocket calculator, you work the problem the same way.

(Or, if you prefer, you could work it right to left, or even—with more complex problems—from the middle outwards).

Working from left to right, press ...

2 ENTER↑ 6 +

The display shows the intermediate answer:

8.00

To solve for (9 — 3.5), press ...

9 ENTER↑
3 · 5 —

The display shows:

5.50

To multiply the two intermediate answers (which have been automatically stored), press ...

x

And the displays shows:

44.00

Even if your problem were as complex as converting indicated air speed to the true mach number ...

$$\sqrt{5\left(\left[\left[\left(\frac{400}{661.5}\right)^2 \cdot 2 + 1\right]^{\frac{1.4}{4}} - 1\right)\frac{29.96}{15} + 1\right]^{.286} - 1\right)}$$

... you would still be able to solve it quickly, easily and without confusion if you used an HP calculator, thanks to RPN—the most sensible logic system a pocket calculator can have!

Optional accessories that protect and increase the versatility of your Hewlett-Packard pocket calculator

[B]

Security Cradle

[C]

Reserve power pack assures you of portable power whenever you need it.

[A]
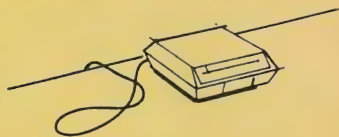
[A] You'll always have a fully-charged spare battery pack on hand when you use this reserve power pack, especially designed for Hewlett-Packard pocket calculators. It comes complete with a spare battery pack.

Simply slip the battery pack into the holder, then plug the holder into the recharger/ac adapter that comes with your calculator. A built-in light-emitting diode tells you that the battery pack is recharging. In six to eight hours', you'll have a fully-charged battery pack to exchange for the one in your calculator.

Temperature range: 0° C to 40° C (32° F to 104° F)
Dimensions: 8 x 8 x 3 cm (3 x 3 x 1")
Weight with battery pack: 110 g (4 oz.)

Battery pack and holder for models HP-45, HP-55, HP-65, HP-80
82004A **$20**⁰⁰

Battery pack and holder for models HP-21, HP-22, HP-25 (shown)
82028A **$15**⁰⁰

*For models HP-45, HP-55, HP-65 and HP-80 the recharging time is between 14 and 17 hours.

## Hard leather case helps protect your calculator outdoors

[B] Using your HP calculator outdoors? Help protect it by carrying it in this hard leather field case. It snaps onto your belt and guards your calculator against normal environmental conditions in the field—dust, dirt, rain, snow, bumps and jars. Calculator removal is easy with the snap-open flap and contoured front opening.

Field case for models HP-45, HP-55, HP-80.
82006A **$20**⁰⁰

Field case for model HP-65
82016A **$25**⁰⁰
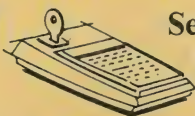
Security cradle helps reduce pilferage

[C] When leaving your HP calculator unattended in the office or lab, you can help guard it against "mysterious disappearance" by means of this ruggedly-constructed security cradle.

A key is used to lock and unlock the cradle holding your calculator. And while your calculator is in place you have complete access to the keyboard and display, with battery pack or ac operation.

The security cradle may be attached to your desk via: (1) four corner screws, (2) center screw attachment, allowing 360° rotation, (3) removable six-foot steel cable, or (4) extremely-hard-to-remove adhesive tape. (All are supplied.)

Security cradle for models HP-45, HP-55, HP-80
82007A **$25**⁰⁰

Security cradle for model HP-65
82015A **$25**⁰⁰

Security cradle for models HP-21, HP-22, HP-25 (shown)
Has built-in prism to provide better viewing angle when on flat surface.

82029A **$30**⁰⁰

Accessories to replace or replenish those received with your pocket calculator

Owner's Handbook		
HP-21	00021-90001	$2.00
HP-22	00022-90001	5.00
HP-25	00025-90001	3.00
HP-45	00045-90300	2.00
HP-55	00055-90001	2.50
HP-65	00065-90200	2.50
HP-80	00080-90001	2.00
Quick Reference Guide		
HP-25	00025-90021	$1.00
HP-45	00045-90303	1.00
HP-55	00055-90002	1.00
HP-65	00065-90203	1.00
HP-80	00080-90003	1.00
Application Books		
HP-25	Application Programs	
	00025-90011	$10.00
HP-80	Real Estate Applications	
	00880-66006	10.00
HP-55	Statistics Programs	
	00055-66002	10.00
HP-55	Mathematics Programs	
	00055-66001	10.00
Soft Case		
HP-21, HP-22, and HP-25		
	82027A	$6.00
HP-45, HP-55, and HP-80		
	82021A	6.00
HP-65	82017A	10.00
Battery Pack		
HP-21, HP-22, and HP-25		
	82019A	$7.00
HP-45, HP-55, HP-65, and HP-80		
	82001A	10.00
Recharger/ac adapter (115 or 230 Vac)		
HP-21, HP-22, and HP-25		
	82026A	$15.00
HP-45, HP-55, HP-65, and HP-80		
	82002A	18.00
Programming Worksheets (Pad of 50)		
HP-65	9320-0616	1.65
Blank Program Cards for HP-65		
40-Card Pac		
	00065-67010	$25.00
120-Card Pac		
	00065-67054	50.00
Pocket Card Holders for HP-65		
Pack of 20	9320-0613	$7.50

22

Hewlett-Packard Business Pocket Calculators...

Designed to help you make profitable business and financial decisions

If you're in business, you know that most of the decisions you're called upon to make involve time and / or money. And the decisions you make affect that important goal: profitability.

With a Hewlett-Packard business pocket calculator, you can have—at your fingertips—the power you need to make profitable decisions anywhere, anytime.

These calculators provide you with all the necessary equations and interest tables (one even has a 200-year calendar) for solving virtually any problem involving the relationship between time and money.

Calculations that would take you considerable time and effort with paper and pencil, or with a four-function calculator, are easily handled with just a few keystrokes when you use an HP business calculator—even if you've had no formal training in business or finance.

Simply follow the step-by-step directions in the Owner's Handbook. The know-how is in the calculator. Almost immediately after you feed in the known data, the answer is displayed—with accuracy to the last penny in a million dollar calculation.

The HP-22 business management pocket calculator puts ideal combinations of financial, mathematical and statistical functions right at your fingertips. You can even handle planning, forecasting, and decision analysis. And you can approach business problems in a variety of ways to arrive at intelligent decisions and recommendations based on facts.

For solving even more complex time-value-of-money problems—including those involving bond yields and prices and the number of days between dates—Hewlett-Packard offers the well-known HP-80 financial pocket calculator and its desktop version, the HP-81.

The ultimate in problem-solving power is yours with the amazing HP-65 fully programmable pocket calculator and the financial application pac. It's like having your own personal, pocket-sized computer and is especially useful for solving lengthy, complex or repetitive problems.

In today's fast-moving economy, it's imperative that you make decisions quickly and accurately. HP's business calculators help you do this by increasing your capability to get the information you need—when you need it.

In these pages you'll discover the extensive range of functions and features offered by the HP-22, HP-80, HP-65, and HP-81, and to help you make your decision, you'll find a comparison chart at the back of this catalog. Whichever one you finally select, consider it an investment with an *excellent* rate of return.

HP-22
Business Management

Specially designed for easy solutions to a wide range of modern management problems.

The uncompromising HP-22 gives you an ideal combination of the financial, mathematical and statistical capabilities you need in modern business.

The new HP-22 pocket calculator is a complete and indispensable management tool for anyone who needs to evaluate and analyze business problems quickly, easily and accurately. With the HP-22, you have the solution to virtually every calculation required for modern business management—right at your fingertips.

Fully-integrated for speed and accuracy.

All the fundamental financial functions of the HP-22 are integrated with a comprehensive range of the statistical and mathematical functions needed in today's business world. With it, you can handle everything from simple arithmetic to complex time-value-of-money computations including interest rates; rates of return and discounted cash flows (net present value and internal rate of return) for investment analysis; extended percent calculations; accumulated interest/remaining balances, amortization and balloon payments. You can even handle planning, forecasting and decision analysis.

Built-in functions for ease of use.

All the financial equations, statistical formulas and mathematical functions are built-in the HP-22. All you have to do is key in your data, press the appropriate keys, and see your answers displayed—in seconds.

The gold key function.

The gold key relates to the gold legends on the keyboard, giving you access to three additional financial functions and thirteen additional mathematical and statistical functions.

The financial capabilities.

12×	12+	ACC	INT	BAL
n	i	PMT	PV	FV

The five keys in the top row of the HP-22 are the basic financial keys that replace equations and interest tables. To use any of the additional functions, press the gold key first. When you enter three known values with the financial keys, you can solve for another unknown value. For example: enter amount of present value [PV]; enter number of periods involved [n]; enter future value [FV]. Then, push [i] and get interest displayed automatically.

Expanded percentages capability.

%Σ	Δ%
	%

Percentage is the common standard of measurement in the business and financial world. For this reason, the HP-22 provides three separate percentage function keys. The [%] key is used to calculate a percentage. For example, to calculate 4% of a displayed number, just key in 4 and press the [%] key. There is no need to convert the 4% to its decimal equivalent of .04.

The [Δ%] key is used to compute the percentage difference (ratio of increase or decrease) between two numbers. The [%Σ] key is used to find what percentage one number is of another number or of a total sum. The HP-22 saves the base number for multiple percentage calculations of the same base number.

The statistical capabilities.

L.R.	ŷ	Σ−	x̄	s
		Σ+		

In addition to the financial capabilities, the HP-22 gives you advanced statistical capabilities for planning, forecasting and analysis. Using the [Σ+] key, you can enter statistical data into five of the ten addressable memories, where it remains unaffected by most other calculations. What's more, using the [Σ−] key you can adjust or correct input data without having to repeat the entire calculation. For example, to project sales, key in past performance data, then press the [LR] key. Then key in the number of the forecast period and press the [ŷ] key to obtain sales at that future point in time. To obtain an average, key in all data, then press the [x̄] key. To find standard deviation (a measure of statistical validity), key in your data, then press the [s] key for the answer.

The mathematical capabilities.

ln	eˣ	yˣ	√x̄
−	+	×	+

The HP-22 gives you virtually all the math capabilities you need in business, such as logs, antilogs, exponentiation and root extraction so you may work out your own solutions to unusual individual problems.

Expanded memory capacity.

In addition to the 5 financial memories and the 4 operational stack memories, the HP-22 provides 10 addressable memories you can use to store data. All you do is press the [STO] storage key and one of the numerical keys. For example, to store a displayed value in the first addressable memory, press [STO][0] and the value will be automatically stored in that memory. To recall the value, press the [RCL] recall key and the [0] key and the value will again be displayed. For added convenience, register arithmetic can be performed with all 10 memories.

Full decimal display control.

Since most business calculations involve dollars and cents, the HP-22 usually displays numbers rounded off to two decimal places.

If you want to display more or fewer than two decimal places you can easily do so by using the gold key and one numerical key.

You may switch the HP-22 to scientific notation for all calculations, if desired. In scientific notation, 8 digits plus the 2-digit exponent are displayed. The full decimal display control of the HP-22 gives you valuable flexibility in obtaining the accuracy you need in virtually any calculation.

The remarkable HP-22 Owner's Handbook.

Even if you lack special training in mathematics, statistics or advanced financial planning, the 148-page Owner's Handbook will make it easy for you to take full advantage of the capabilities of the HP-22. The book is a valuable survey course in modern management problem-solving, analysis and planning. It provides formulas and procedures for solving more than 50 different financial, mathematical and statistical functions on the HP-22. Be sure to ask your dealer to let you examine a copy of the HP-22 Owner's Handbook. You may be surprised at how easy to operate the HP-22 really is.

Plus other quality HP features . . .

The HP-22—like other Hewlett-Packard pocket calculators—features the famous RPN logic system that facilitates the handling of lengthy, complex or repetitive problems.

Light-emitting diode display— Displays up to 8 significant digits, plus two-digit exponent and appropriate signs. Two selectable display modes: fixed point, with automatic overflow for large numbers into scientific, and scientific with a dynamic range of 10^{99} to 10^{-99}. Automatic decimal point positioning. Selective round-off; range: 0-9 decimal places in fixed point. "Error" appearing in the display indicates improper operation. All decimal points lighted indicates low battery.

Functions and features.

Financial functions: Number of periods [n] • Periodic interest rate [i] • Periodic payment amount [PMT] • Present value [PV] • Future value [FV] • Yearly to monthly conversion [12x] • Annual to monthly interest rate [12÷] • Accumulated interest between two time periods [ACC] • Simple interest [INT] • Remaining loan balance [BAL] • Percent of total [%Σ] • Percentage [%] • Percent difference [Δ%] • Begin-End Switch calculates payments due at beginning or end of period.

Statistical functions: Number of variables and sum of two [Σ+] • Corrects an incorrect Σ+ entry [Σ−] • Mean or arithmetic average [x̄] • Linear regression [LR] • Standard deviation [s] • Linear estimate [ŷ].

Mathematical and arithmetical functions: Natural log, base e [ln] • Natural antilog [eˣ] • yˣ • √x̄ • − • + • × • ÷ .

Data storage and positioning operations: Exchange contents [x⇆] • Stack roll-down [R↓] • Data recall [RCL] • Data storage [STO].

Memory:

10 separate addressable memories with full register arithmetic • 5 financial memories • 4 operational stack memories with stack roll-down for review.

Specifications:

Physical Specifications: Calculator Length: 13.02 cm (5⅛") • Width: 6.83 cm (2¹¹/₁₆") • Height: 3.02 cm (1³/₁₆") • Weight: calculator: 170.1 g (6 oz) • recharger. 141.8 g (5 oz) • shipping weight: approx. 680 g (1½ lb.) • Operating temperature range: 0°C to 45°C (32°F to 113°F)

Power Requirements: AC: 100-127 V or 200-254 V, ± 10%, 50 to 60 HZ, 5 watts • Battery: 2.5 Vdc nickel-cadmium rechargeable battery pack.

The HP-22 Outfit includes:

HP-22 Business Management Pocket Calculator • Rechargeable battery pack • Recharger/ac adapter • Soft carrying case • Illustrated Owner's Handbook.

HP-22 Outfit **$165⁰⁰**

HP-80 Financial

The finest pocket calculator ever designed for time– and–money management

For calculating most financial problems—even a bond price or yield—in seconds, without referring to tables

The HP-80 Financial lets you solve business math or time-and-money problems quickly and easily.

All the interest equations and tables have been built-in . So has a 200-year calendar, used in solving for bond price and yield, or short-term interest.

It's designed to handle general business math problems

Percentages

%		△ %

The "%" and "△%" keys allow you to easily handle problems concerned with: percentages; net amounts (markups, discounts, chained discounts, dealer discount ratios, anticipation discounts, etc.), and percent difference.

Just press the keys to solve time-and-money problems in seconds

At the top of the HP-80's keyboard are five keys for solving all types of business problems involving compound interest or compound growth. They replace the compound interest, discount, bond and annuity tables commonly in use. Merely enter the known amounts (the data) and press the appropriate keys.

n	i	PMT	PV	FV

Number of periods—To enter or find the number of time periods, payment periods, compounding periods, etc.

Interest rate per period—To enter or find the compound interest rate.

Payment per period—To enter or find the payment or deposit amount.

Present value—To enter or find the loan amount, principal amount, current price, beginning value or investment—the "now money."

Future value—To enter or find the final balance—after all the interest and deposits, or payments have been added.

The HP-80's financial keys save you time and effort when calculating:

Compounded Amounts (compound interest)

It takes but a few seconds to solve for: present value and future value amounts; rate of interest; number of periods; interest earned; effective annual interest rate, and nominal (stated) annual interest rate.

Amortized (direct reduction) loans (ordinary annuity)

You can solve for: the number of payments; the number of payments to reach a specified balance; payment amount; annual percentage rate, with or without fees; principal amount; amortization schedules; remaining balance (remaining principal, last payment, balloon payment) and accumulated interest; payment amount for loan with a balloon payment; annual percentage rate with balloon payment coincident with, or one period after, the last payment; price and yield of discounted mortgages (prepaid or fully amortized), and the mortgage factor for Canadian mortgages.

Loans with a constant amount paid toward the principal

With the HP-80 you can prepare a payment schedule showing the interest portion per payment and the remaining balance, when a constant amount is paid toward the principal.

Sinking funds (ordinary annuity)

The HP-80 can calculate: payment amount, interest rate, number of payments and debt retirement amount.

Consumer loans

Just press the keys to calculate the monthly payment amount, or to convert the add-on interest rate to the annual percentage rate of interest. And, using the Rule of 78's, you can use the HP-80 to calculate rebates.

Also, you can convert the annual percentage rate to the add-on rate.

Savings functions (annuity due)

You can calculate the number of deposits, the rate of interest, the deposit amount and the future value.

Lease and rent functions (annuity due)

The HP-80 can be used to convert the add-on interest rate to the annual percentage rate, or vice versa.

You can calculate: the number of payments; rate of interest; payment amount; payment amount with balloon payment or residual value, and present value.

Discounted cash flow analysis

Σ+		Σ—

You can quickly and easily perform a discounted cash flow analysis, and calculate the net present value of even, uneven or deferred payment streams.

The HP-80 can also be used to calculate the discounted or internal rate of return (iteration of above).

Equity investment analysis for income property

You can use the calculator to solve for: equity yield rate; equity investment value and present value; and future value and overall appreciation/depreciation rate.

Bond functions

YTM	INTR	BOND

The HP-80 has built-in function keys for bond calculations: "Yield-To-Maturity," "INTeRest" and "BOND". You can calculate bond price, yield and after-tax yield, accrued interest (between coupons) and bond amortization. You can also calculate a callable bond price and yield-to-call.

Commercial loans (short term notes)

INTR

The HP-80's "INTeRest" key lets you calculate the accrued interest amount or the discount amount and annual yield for a discounted note (for either a 360- or 365-day year).

Calendar functions

DATE

DAY

This key puts a 200-year calendar (1900 to 2099) at your fingertips. You can find: the number of calendar days between two dates; the day of the week a date falls on; a future date, or a past date, given the number of days from a known date.

Depreciation functions

COMPUTE

SOD

The HP-80 incorporates a unique key labeled "SOD" for calculating sum-of-the-years'-digits depreciation—amount and remaining balance—on a full-year or partial year basis.

You can also calculate the depreciation amount and remaining balance via the straight-line method, or via the declining-balance method (full year or partial year).

Statistical functions

	Σ—	→Σ
TL	Σ+	x̄

By using the "Trend Line" key, you can easily calculate: a trend line (time series linear regression) giving you the y-intercept (value at point 0); the number of time periods; the slope, and automatic projections.

The HP-80 can also calculate: the mean and the standard deviation, with the ability to change data points after a calculation and recalculate. The "Σ+" key provides running totals and computes the sum of the squares and the number of entries.

Memory power

In addition to the four memory stack, the HP-80 has an addressable memory for storing constants or other numbers to be used later on in a calculation.

Plus other quality HP features . . .

The HP-80 features the famous RPN logic system.

Light-emitting diode display— Displays up to 10 significant digits, plus two-digit exponent and appropriate signs. Two selectable display modes: fixed point, with automatic overflow for large numbers into scientific, and scientific with a dynamic range of 10^{99} to 10^{-99}. Automatic decimal point positioning. Selective round-off; range: 0-6 decimal places in fixed point. Flashing display indicates improper operation; flashing decimal points indicate low battery.

And a financial application book

Also with the HP-80 you get a 101-page book offering dozens of keystroke sequences that benefit brokers, investors, appraisers, assessors, mortgage bankers, analysts and other decision makers in investment analysis .

Functions and features

Keyboard commands:

Financial functions: Number of periods (n) • Interest rate (i) • Payment per period (PMT) • Present value (PV) • Future value (FV) • Simple interest (INTR) •Sum-of-the-years'-digits depreciation (SOD)

Bond functions: Bond prices • Bond yields • 200-year calendar

Statistical functions: Mean, standard deviation (sum-of-the-squares) • Trend line

Mathematical functions: Percentage • Percent difference • $\sqrt{x}$ • y^x • Addition, subtraction, multiplication or division in serial, mixed serial, chain or mixed chain calculations

Data storage and positioning operations: Data entry • Stack roll down • x, y interchange • Data storage • Data recall • Change sign

Memory:

Four-memory stack • Addressable memory.

Specifications

AC: 115 or 230 V ±10%, 50-60 Hz.
Battery: 3.75 Vdc nickel-cadmium rechargeable battery pack.
Weight: HP-80: 255 g (9 oz.) with battery pack • Recharger: 142 g (5 oz) • Shipping weight: approx. 900 g (2 lb).
Dimensions: Length: 14.7 cm (5.8 in) • Width: 8.1 cm (3.2 in) • Height: 1.8 to 3.3 cm (0.7 to 1.3 in). *Operating temperature range:* 0° C to 50° C (32° F to 122° F).

Scientific and Business Desktop Calculators
With an alpha-numeric printer

HP-46 Advanced Scientific

If you prefer a desktop scientific calculator with a printer, select the HP-46. It includes all of the built-in functions of the HP-45 *plus* a paper tape printout to provide a permanent record of your calculations.

Alpha-numeric symbols identify each calculation
More than just a running tape of your figures, the printout provides you with easy-to-read alphanumeric symbols for each function . . . so your *method* of calculation is also recorded.

Superior memory power is also provided
At the press of a key, the HP-46 lets you recall any number in the four-memory stack. Or it lists the contents of all 9 addressable memories.

Tape and/or display
The light-emitting diode display may be used with the tape printout, to help in editing during long calculations . . . or without the printout, to conserve paper.

Plus other quality HP features . . .
The HP-46 also includes a four-memory stack, which makes possible the famous RPN logic system, and a "Last X" memory. Inside its modern, low-profile case are large-scale integrated circuits (LSI).
For the complete list of the HP-46's built-in functions and other features—and information on the LED display—please refer to those shown for the HP-45.

Specifications:
Power: AC: 115 or 230 V, ±10%, 48-66 Hz
Weight: 6.12 kg (13 lbs. 8 oz.)
Dimensions: Length: 39.3 cm (15.5 inches)
• Width: 27.7 cm (10.9 inches) • Height: 14.0 cm (5.5 inches)
Operating temperature range: 0°C to 45°C (32°F to 113°F)

The HP-46 outfit includes:
HP-46 Advanced Scientific Desktop Calculator • Portable carrying case • Dust cover • Spare fuses • Power cord • Printer paper and ribbon • Illustrated Operator's Guide

HP-46 Outfit $675⁰⁰*

HP-81 Financial

Designed for solving any type of business or financial problem—even those involving bonds or the exact number of days—the HP-81 offers all of the capabilities of the HP-80, plus more. And, it features an alpha-numeric printout, providing symbols as well as numbers for each function, for reference at any time.

With extra power for extended calculations
The HP-81 also prints complete, labeled schedules for 10 extended calculations: Interest per period • Discounted rate of return • Declining balance depreciation • Diminishing balance depreciation • Sum-of-the-years'-digits depreciation • Rule-of-78's prepayment • Amortized loan schedule • Odd days' interest • Coupon equivalent yield • Percent of total.
And, the HP-81 performs calculations in any of 10 modes: pre-tax or after-tax, annual or semi-annual coupon, 30-day or actual-day/month, 360- or 365-day, and bond or note.

More addressable memories
In addition to the four-memory stack found in all HP calculators, the HP-81 has 20 addressable memories to store constants or other data. Full register arithmetic—adding to, subtracting from, multiplying by, or dividing into data stored in addressable memories—is fast and easy.

Tape and/or display
The light-emitting diode display may be used with the tape printout, to help in editing during long calculations . . . or without the printout, to conserve paper.

Plus other quality HP features . . .
Like the other HP calculators, the HP-81 uses RPN logic and is made with large-scale integrated circuits (LSI). It's about the size of an adding machine.

For the complete list of the HP-81's built-in functions (in addition to those mentioned above), and details on the LED display, please refer to the HP-80.

Specifications:
Power: AC: 115 or 230 V, ±10%, 48-66 Hz.
Weight: 6.12 kg (13 lb, 8 oz)
Dimensions: Length: 39.3 cm (15.5 in)
• Width: 27.7 cm (10.9 in) • Height: 14.0 cm (5.5 in).
Operating temperature range: 0° C to 45° C (32° F to 113°).

The HP-81 outfit includes:
HP-81 Financial Desktop Calculator • Portable carrying case • Dust cover • Spare fuses • Power cord • Printer paper and ribbon • Illustrated Operator's Guide

HP-81 Outfit $1,025⁰⁰*

Fast Entry Option. Acts as special memory device (buffer) for keys. Permits ultra-fast operation without keys jamming, so HP-81 can be solving one problem as another is being keyed in. Optional (at time HP-81 is ordered) $225.00*

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"Look beyond what you're doing today...look to tomorrow"

How to select the calculator that's best for your type of problem-solving—today and tomorrow

Selecting the *right* pocket calculator can be a joy forever. Selecting the *wrong* one can waste your time and money . . . resulting in errors . . . and cause you aggravation and frustration.

That's why, before you select *any* pocket calculator, you should make sure it can solve *all* of your problems—the ones you face today and the ones you're likely to face tomorrow.

The calculator you select should have *all* of the capabilities you need—all the built-in functions, memories and other features required to solve *your* specific problems quickly, easily, accurately and without confusion.

If the problems you face involve only addition, subtraction, multiplication and division, almost any well-made four-function calculator will suffice—providing it can handle the required number of digits. You may also want it to include "%" and constant keys.

But when your problems extend beyond basic arithmetic, then you need a *professional* pocket calculator—designed and manufactured for day-in, day-out professional use.

Professional calculators are designed with the specific capabilities required to quickly and easily solve problems intrinsic to a specific discipline or application. The nomenclature on the keys gives you a quick insight into the types of problems the calculator can help you solve. Broadly speaking, there are two main types of professional pocket calculators: *scientific* for the scientific and engineering disciplines and *business* for the broad business and more exacting financial disciplines.

Scientific Pocket Calculators

A professional scientific calculator should provide the standard log and trig functions, so you don't have to refer to tables or interpolate from those tables. Just press the keys to get your answer—an answer far more accurate than any slide rule can give you. These "full scientific" calculators also provide exponential, square root and reciprocal functions.

For handling more advanced types of scientific, engineering, mathematical or statistical problems, you need an "advanced scientific" calculator. These have all the built-in functions found in the full scientific machines, *plus* a variety of others, depending upon which model you select. These may include: mean, standard deviation, linear regression (trend line), and U.S./metric conversions.

Advanced models also offer more memory power . . . more sophisticated trig functions, such as rectangular coordinate/polar coordinate conversion . . . selectable modes (degrees, radians and, possibly grads) . . . conversion between

decimal angle and angle in degrees/minutes/seconds . . . and others.

This added capability facilitates the handling of complex problems and can drastically reduce the time and effort necessary to solve them. For example, polar/rectangular coordinate conversions let you add or subtract vector components in seconds, simply by pressing a few keys.

The most proficient type of professional scientific pocket calculators is the programmable. When solving complex, repetitive or iterative problems, programming can be invaluable. You enter your problem-solving sequence of keystrokes just once . . . then, with just one keystroke initiate the entire sequence—as often as you wish.

But whatever scientific calculator you choose, the *more* functions and features it has, the more capability it has to solve more types of problems—even the most complex—faster and easier, reducing the work *you* have to do. And the less chance for error. So compare functions and features carefully before you make your final selection.

Business Pocket Calculators

Although a scientific calculator may be used for solving the more basic types of business problems, calculators especially designed for business and/or financial problems can soon pay for themselves in terms of time and effort saved—because they are made to solve *your* business problems—giving you the exact answers you need *when and where you need them*.

A business calculator should provide all of the fundamental financial functions to solve problems involving interest rates; rates of return and discounted cash flows; extended percent calculations; remaining balances, amortization and balloon payments.

But in addition, a business calculator should help the modern business manager in planning, forecasting and decision analysis. For these problems, a business calculator should provide advanced statistical capability, mathematical functions, and extra memory power.

In addition to business pocket calculators, there are also "advanced business" or "financial" calculators. These usually have all of the functions found in business calculators, but will also have more specialized capabilities to solve problems involving depreciation, bond prices and yields. And because the latter require a calendar, these types of calculators will have one "built-in."

For specialized business or financial problems, involving extended calculations or unique and complex formulas, a programmable calculator can be a tremendous time-saver. Since you enter your problem-solving sequence of keystrokes just once—and then with one keystroke start an entire sequence—you reduce your error ratio and as a result, have confidence in your answers.

Another point to consider when selecting a business calculator, is the basic financial concepts you work with daily as a decision maker handling business transactions. The calculator you select should help you in making your decisions, because you could very well make or save far more than the calculator costs, the very first time you use it. And this, according to a basic business concept, would be a very nice return on investment.

Four features that can help make your problem-solving easier

Before you make your final selection of a pocket calculator, take a closer look at four features that can make your problem-solving easier and more reliable. These are programming, memory power, the logic system, and construction.

Programmable Calculators

As stated previously, when solving very complex or repetitive or iterative problems with a pocket calculator, you have to press a lot of keys—sometimes the same keys over and over. To reduce the number of keystrokes, and keystroke errors, certain pocket calculators can be programmed—directed to initiate the desired keystrokes automatically. And that's just what a program is: a sequence of keystrokes, used to solve a problem or series of problems. Once a calculator is programmed, all *you* have to do is key in the data—the numbers for the specific problems you're solving—and press one key to run the entire program.

A pocket calculator may be either "programmable" or *"fully programmable."* A programmable machine can usually be programmed only by pressing the keys. (Then the program is temporarily stored in the program memory, where it remains until removed or changed by the calculator operator or until the calculator is turned off.)

With a fully programmable pocket calculator, that same program can also be permanently stored on an external device (such as magnetic cards) and re-entered in the program memory when needed.

Programming can be an extremely useful feature, saving time and energy and helping to avoid keystroke errors. Depending on the model, a programmable calculator may have provision for editing a program (adding, deleting or changing steps) and such computer-like operations as branching—choosing between two alternate steps depending upon the outcome of a relational test. A programmable calculator can actually make logical decisions *for* you.

So if you find yourself pressing dozens of keys to solve certain types of problems, give serious consideration to a calculator you can program.

For occasional programming, a "programmable" machine (*i.e.,* one with temporary storage capability) should suffice. But if you *frequently* handle problems that can be programmed, consider a "fully programmable" calculator, and record your programs on program cards. You might even find your general applications already programmed for you.

Memory Power

Every pocket calculator should have at least one addressable memory—to store constants or other numbers used more than once in a calculation. The more memories a calculator has, the less writing down of numbers that *you* have to do.

With certain calculators having addressable memories, you can do register arithmetic—you can directly add to, subtract from, divide into or multiply the contents of a register. This makes data manipulation exceptionally easy, even when working problems involving three simultaneous linear equations (or other 3 x 3 matrix inversions).

Besides addressable memories, certain pocket calculators have an automatic memory (also called an operational stack, a four-memory stack, etc.). Entries and intermediate answers are stored automatically, then re-entered into the calculation at the appropriate time. Obviously, this eliminates the need for you to write down and re-enter numbers, which could lead to errors, and it speeds the work.

Logic Systems

A logic system is the "language" you use to communicate with a calculator—the way in which you key in problems and the way the calculator is designed to handle the problems. One logic system may require you to restructure an equation to conform to the system; another may not.

The two most common types of logic systems used in professional pocket calculators are algebraic and RPN logic. You may wish to check out both systems, and determine for yourself: which is the easiest to use (especially important when solving complex problems) . . . which is the least confusing (so you can have confidence in your answers) . . . and which is the best to use for solving the kinds of problems *you* face regularly.

Construction Is Important

In addition to everything mentioned so far, you should also—before selecting a professional calculator—consider the quality . . . the physical construction of the calculator (is it rugged enough for daily use?) . . . the availability of accessories and applications books . . . and, of course, remember, a good value is a calculator that's capable of solving *your* problems today . . . and tomorrow.

With all this in mind, study the descriptions of each calculator, compare the models, and select the *one* machine that comes *closest* to filling your needs.

HP Calculator Comparison Chart

Check the features and functions you need
before you select your calculator.

FEATURES/FUNCTIONS	HP-21	HP-45	HP-46	HP-25	HP-55	HP-65	HP-22	HP-80	HP-81
		SCIENTIFIC		Programmable				BUSINESS	
RPN Logic System	●	●	●	●	●	●	●	●	●
Memory									
☐ Automatic four-memory stack	●	●	●	●	●	●	●	●	●
☐ Addressable memory	1	9	9	8	20	9	10	1	20
☐ Financial memory							5		
☐ Last x memory		●	●	●	●	●			
☐ Program memory				49	49	100			
Data Storage, Positioning Operations									
☐ Exponent entry	●	●	●	●	●	●			
☐ Stack roll-down	●	●	●	●	●	●	●	●	●
☐ Stack roll-up						●			
☐ x, y memory interchange	●	●	●	●	●	●	●		
☐ Data storage, Data recall	●	●	●	●	●	●	●	●	●
☐ Change sign	●	●	●	●	●	●	●	●	●
Display									
☐ Ten significant digits	●	●	●	●	●	●	●	●	●
☐ Two exponential digits	●	●	●	●	●	●	●	●	●
☐ Selectable formatting, rounding in fixed notation	●	●	●	●	●	●	●	●	●
☐ Scientific notation	●	●	●	●	●	●	●	●	●
☐ Engineering notation				●					
☐ Automatic overflow into scientific	●	●	●	●	●	●	●	●	●
☐ Automatic underflow into scientific	●			●	●				
☐ Improper operating and low battery indicators	●	●	●	●	●	●	●	●	●
Special Features									
☐ Digital Timer						●			
☐ Alpha-numeric printout on paper tape			●						●
☐ Calendar						●*		●	
Programming Features									
☐ Editing:									
☐ Program review—back step				●	●				
☐ Program review—single step				●	●	●			
☐ Insert/Delete						●			
☐ Overwrite				●	●				
☐ Direct branching				●	●	●			
☐ PAUSE				●					
☐ Conditional tests				8	2	4			
☐ Flags						●			
☐ DSZ (looping)						●			
☐ Subroutines						●			
☐ Permanent program storage						●			
Built-in Statistical Functions									
☐ Mean and standard deviation (number of variables)		1	1	1	1 or 2	1 or 2*	1	1	1
☐ Trend line (a time-series linear regression)								●	●
☐ Trend line projection								●	●
☐ Linear regression					●	●*	●		
☐ Linear estimate					●	●*	●		
☐ Factorial		●	●		●	●			
☐ Summations (n, Σx, Σx^2)								●	
☐ (n, Σx, Σx^2, Σy)		●	●						
☐ (n, Σx, Σx^2, Σy, Σxy)				●			●		
☐ (n, Σx, Σx^2, Σy, Σy^2, Σxy)					●	●*			

For persons in the fields of science, engineering, business and finance.

FEATURES/FUNCTIONS	SCIENTIFIC			Programmable			BUSINESS		
	HP-21	HP-45	HP-46	HP-25	HP-55	HP-65	HP-22	HP-80	HP-81
Financial Built-in Functions									
☐ Number of periods						●*	●	●	●
☐ Interest rate/period						●*	●	●	●
☐ Payment/period						●*	●	●	●
☐ Present value						●*	●	●	●
☐ Future value						●*	●	●	●
☐ Simple interest						●*	●	●	●
☐ Accumulated interest						●*	●	●	●
☐ Remaining balance						●*	●	●	●
☐ Bond prices, yields						●*		●	●
☐ Rule of 78's interest rebate						●*		●	●
☐ Sum-of-years-digits depreciation schedule						●*			●
☐ Declining balance depreciation schedule						●*			●
☐ Diminishing balance depreciation schedule						●*			●
☐ Amortized loan schedule						●*			●
☐ Percent of total extension						●*			●
☐ Effective annual interest rate converted to nominal rate						●*			
☐ Add-on interest rate with odd-days interest converted to annual rate						●*			●
☐ Internal rate of return (IRR)						●*			●
☐ Coupon-equivalent yield						●*			●
☐ Note price and yield (before maturity)									●
☐ Beginning/Ending Period Switch							●		
Built-in Scientific Functions/Mathematics									
Trigonometric:									
☐ Decimal degrees mode	●	●	●	●	●	●			
☐ Radians mode	●	●	●	●	●	●			
☐ Grads mode		●	●	●	●	●			
☐ Sin x, Arc sin x, Cos x, Arc cos x, Tan x, Arc Tan x	●	●	●	●	●	●			
☐ Rectangular coordinates ↔ Polar coordinates	●	●	●	●	●	●			
☐ Decimal angle (time) ↔ Angle (time) in deg (hr.)/min/sec		●	●		●	●			
☐ Angle in degrees ↔ Angle in radians						●			
☐ Angle (time) arithmetic					●	●			
Logarithmic:									
☐ Log x	●	●	●	●	●	●			●
☐ Ln x	●	●	●	●	●	●	●		
☐ e^x	●	●	●	●	●	●	●		
☐ 10^x	●	●	●	●	●	●			
Metric Conversions:									
☐ Inch ↔ Millimeter					●				
☐ Inch ↔ Centimeter		●	●			●*			
☐ Foot ↔ Meter					●	●*			
☐ Gallon ↔ Liter		●	●		●	●*			
☐ Pound ↔ Kilogram		●	●		●	●*			
☐ Force in pounds ↔ Newton					●	●*			
☐ Fahrenheit ↔ Celius					●	●*			
☐ Btu ↔ Joule					●	●*			
Other:									
☐ y^x	●	●	●	●	●	●	●	●	●
☐ √x	●	●	●	●	●	●	●	●	●
☐ 1/x	●	●	●	●	●	●			
☐ x²		●	●	●	●	●			
☐ π	●	●	●	●	●	●			
☐ %		●	●	●	●	●	●	●	●
☐ Δ%		●	●				●	●	●
☐ %Σ							●		
☐ +, −, ×, ÷	●	●	●	●	●	●	●	●	●
☐ Absolute value				●		●			
☐ Integer/fraction truncation				●		●			
☐ Decimal/octal conversion						●			

*Not a built-in function, but available on pre-recorded magnetic program cards. For a full listing, see current list of Software Pacs, pages 18 and 19.